VOL XVII. No. 4 APRIL 1932

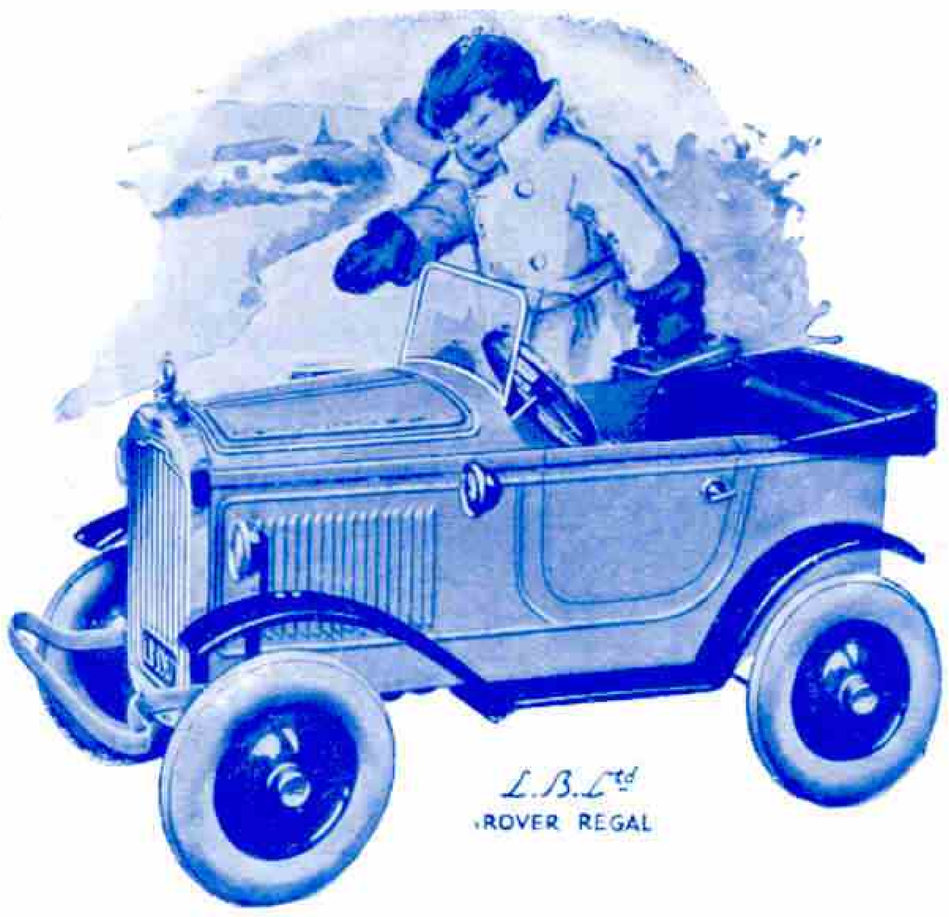
MECCANO MAGAZINE

FITTING THE AQUITANIA'S RUDDER

(See page 250)

6D.

Toy Cars with the real car look!



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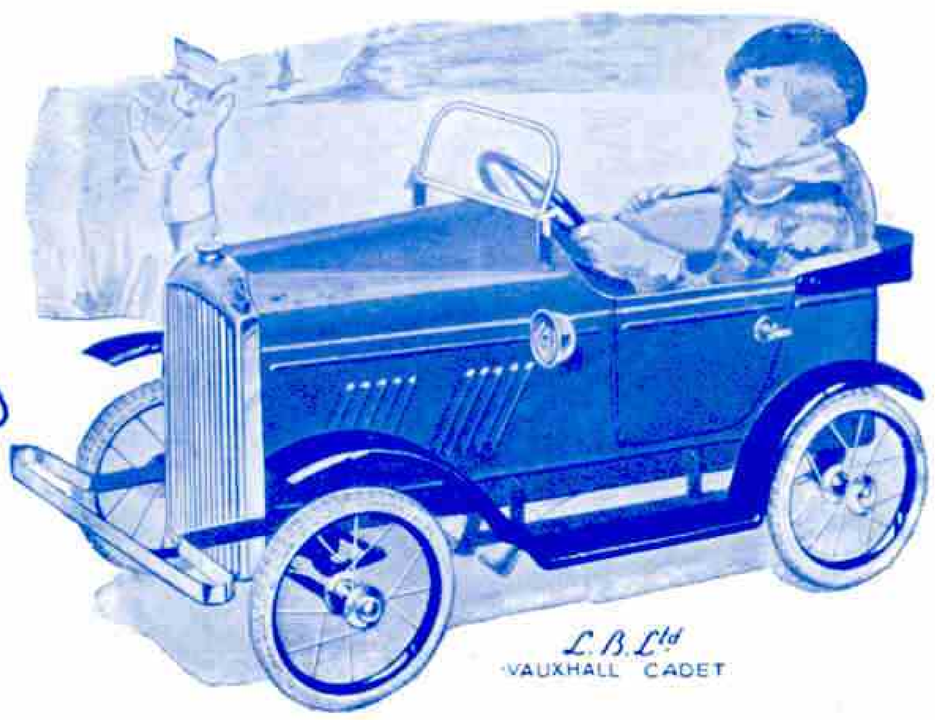

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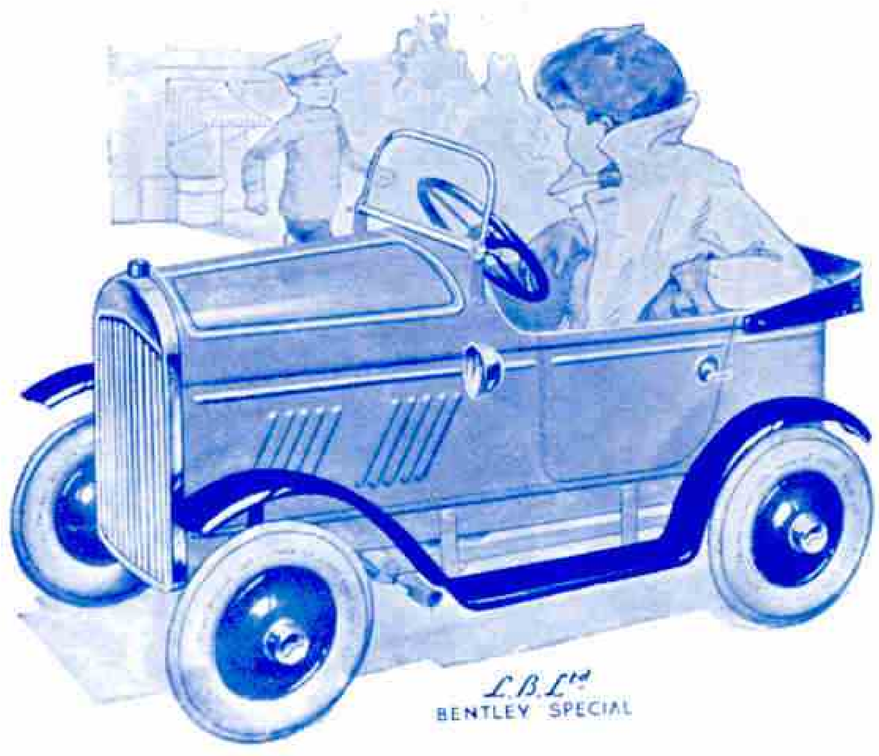

BENTLEY SPECIAL.—*Plated Bentley radiator, adjustable windscreen, side door, 8" balloon wheels. Upholstered back, dummy hood. Mudguards and steps. Finished blue. For kiddies 2½-5 years.* **25/6**

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NEXT MONTH: "AVIATION OF THE FUTURE." PUBLISHING DATE: 30th APRIL

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With the Editor

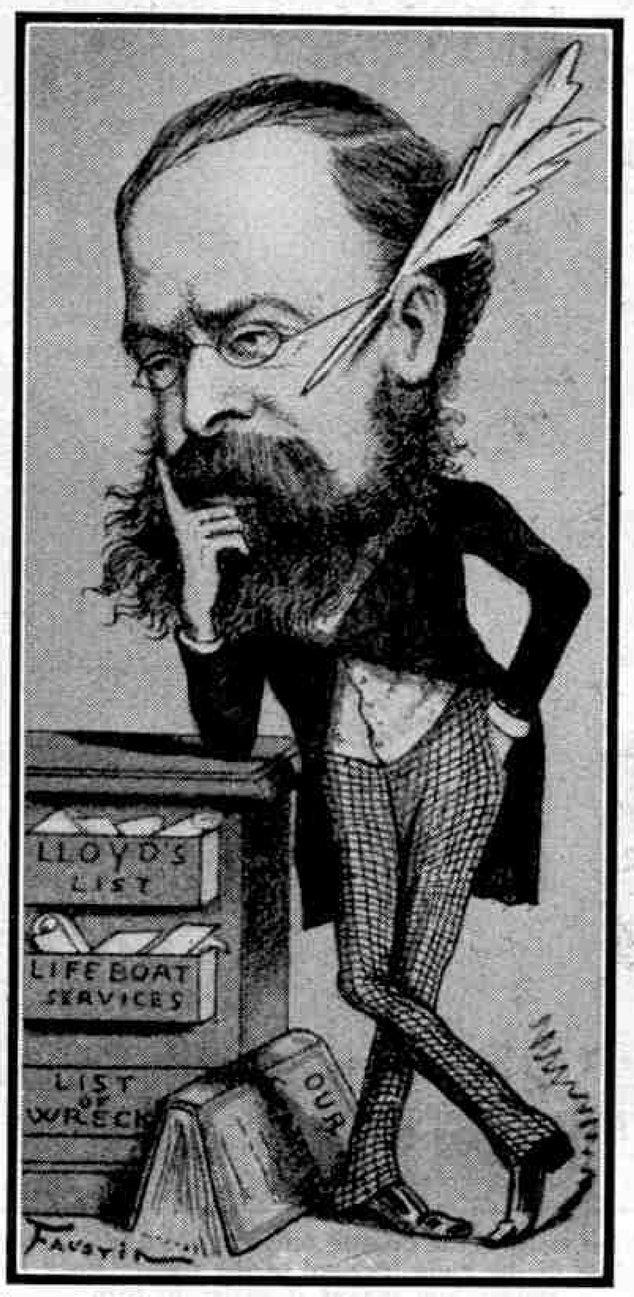
Safety at Sea

Recently an important step in the interests of safety at sea was taken in this country by the passage through Parliament of a Bill authorising the adoption of new regulations in regard to the position of the load line on vessels going to sea, and the equipment of life-saving apparatus and means of communicating by wireless. These regulations were worked out at a conference held in London in 1930 by experts representing 29 countries interested in navigation, and when they are put into practice the same rules providing for the safety of life at sea will be in use in vessels of practically every country in the world.

To many readers the most interesting feature of the new regulation will be the change that is made in helm orders. In the days when the tiller was used for steering all ships, a vessel was turned to starboard, that is to the right, by moving the tiller over to the left or port side; and as the orders referred to the tiller, the order to port really meant turning the ship to starboard, and the order to starboard meant turning the ship to port. Under the new regulations, when the order to port is given it will mean that the vessel is actually to be turned to the port side. Seamen have expressed great reluctance to make the change, particularly on the ground of historical association, but still more because they feared that confusion, and possibly disaster, would result. Nautical opinion is still divided as to the advisability or otherwise of the change, but seamen will be given full opportunities of becoming accustomed to the new orders before these are put into force. In any case we may be sure that the orders will be carried out with the splendid loyalty and thoroughness that has always characterised the British Mercantile Marine.

The load line now marked on vessels to indicate the depth beyond which they may not be submerged is commonly named the "Plimsoll Mark." It was first used in this country as a result of the efforts of Samuel Plimsoll, a noted politician and social reformer. Plimsoll was a Member of Parliament whose indignation was aroused by the unscrupulous manner in which unseaworthy and overloaded ships were sent to sea. He began a direct attack on these "coffin ships," which frequently met with disaster, but his first efforts were unavailing, a Bill he introduced being so greatly altered that it had to be dropped. Plimsoll was so angry that he called the shipowners in the House "villains," and shook his fist at the Speaker! Later he was more successful, and in 1876 a Bill was passed compelling shipowners to mark the limits to which their vessels should be sunk in the water when fully loaded.

The adoption of an international load line is a reminder that markings of this character actually were in use more than 600 years ago. The Venetian, Genoese and other Italian vessels of that period brought Eastern silks and other produce across the Mediterranean to Western Europe, and the greatest care was taken not to endanger the valuable cargoes by overloading the ships. In Venice a mark was made on the outside of the hull of each ship, and if this was more than a certain distance below the waterline when the vessel was loaded, sufficient cargo had to be taken out to bring it to a more reasonable level again—and then the owner was fined! Thus the practice of the Venetians was similar to the use of the Plimsoll Mark, but the older load line rules were more effective than those introduced in this country in 1875, for at first the position of the Plimsoll Mark was not determined by means of any special rules, but was left for the shipowners themselves to fix! In one case the mark was derisively placed on the funnel of a vessel, and it was not until 1890 that Government rules and conditions for its position were introduced.



Samuel Plimsoll, M.P., from a caricature in "The London Sketch Book."

New Land Speed Records

It is a great tribute to the quality of British engineering that the most coveted of all speed records, those on land and in the air, have been held by British machines for many years. In both cases aero engines manufactured entirely in this country have played a great part in gaining and keeping the records, for a Rolls-Royce engine was installed in the Vickers Supermarine seaplane in which Flt. Lt. Stainforth reached a speed of 407.5 m.p.h. in September of last year, and the "*Blue Bird*," the famous racing car in which Sir Malcolm Campbell created the world's land speed record, has a Napier aero engine.

Speed records on land now seem to be a British monopoly. A succession of famous drivers raised the figure from 170.624 m.p.h. in 1926 to 245.736 m.p.h., the speed reached in 1931 by Sir Malcolm Campbell, but even this astonishing record did not satisfy the driver of the "*Blue Bird*." He was sure that the car could do more, and he decided to make a further attempt this year. The improvements made in readiness for the effort were brilliantly successful, for on 24th February the car covered the measured mile on Daytona Beach, Florida, at an average speed of 253.968 m.p.h. for two runs in opposite directions of the course. A strong wind was blowing, and on his southward run, when he gained a certain amount of benefit from it, Sir Malcolm travelled a mile in 12.46 seconds, giving the amazing speed of 267.457 m.p.h. A second attempt two days later was not quite so successful, the condition of the track not being really favourable; but Sir Malcolm set up further records for distances of five miles, and five and ten kilometres respectively. As he made a new flying kilometre record when setting up new figures for the mile, he now holds five world records for speed on land.

Some Forthcoming Articles

Interesting articles to appear in early issues of the "*M.M.*" include a splendid series dealing with water engineering. These will tell the story of the earliest efforts to obtain supplies of pure water and will deal with the wonderful aqueducts built by the Romans as well as with the construction of the great modern reservoirs from which large centres of population derive ample supplies even in times of drought. Contributions dealing with the romance of whaling and with the story of clocks also will appear shortly, and I feel sure that these will prove equally attractive.

How Giant Liners are Steered

Marvels of the Modern Rudder

THE stern rudder as we know it to-day came into use in northern waters about the reign of Henry III. Previous to that northern vessels had rudders fitted on the starboard quarter, like those of the Viking ships. This rudder was quite effective for oar-propelled ships with bow and stern practically alike, but it was unsatisfactory for real sailing ships. With the wind on the starboard side of the ship, for instance, the rudder was liable to be almost entirely out of the water. The sailing ships of the Mediterranean overcame this drawback to some extent by having two rudders, one on each side, but eventually it became generally recognised that the stern rudder provided the only satisfactory solution to the problem.

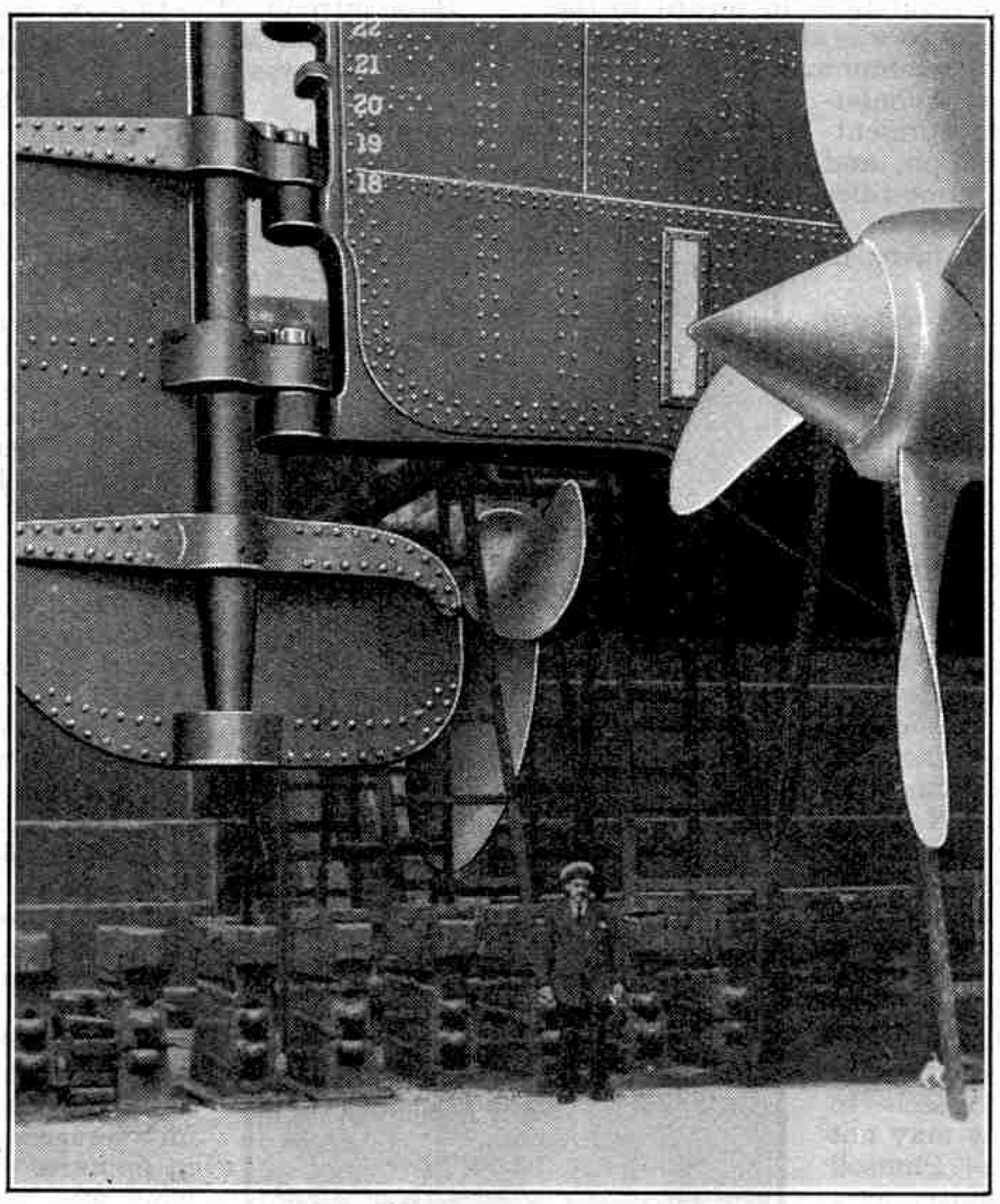
The earliest definite representation of a rudder hung on the stern-post is probably that on the seal of Elbing, Germany, dated about 1242; and Flemish port records of 10 years later distinguish clearly between ships with stern rudders and those with quarter rudders.

In its simplest form the rudder is a metal or a wooden plate fitted vertically to the stern of a ship and movable to the right or left through a considerable angle. When the rudder is not deflected its surfaces are parallel to the ship's direction of travel and it does not influence the ship. Immediately the rudder is deflected to either side, however, its surfaces are inclined to the direction of travel and the great pressure of the water against it pushes it back, the stern of the ship moving with it. Thus the ship is turned in the desired direction. In small vessels a lever is fitted to the upper end of the rudder and provides the means of turning it about the stern-post, but in large vessels a steering wheel takes the place of the lever.

The ordinary rudder fitted to many merchant ships is of what is known as the plate type, and consists of a steel rudder plate held firmly between horizontal pairs of arms called "stays" that project in one direction from a steel shaft called the "stock." The plate is riveted to the stays, which project a short distance at the side of the stock opposite to that carrying the plate, each projection, or "gudgeon" as it is called, having a hole that is occupied by a cone-shaped bolt or "pintle." When the rudder is in position these pintles pass also through corresponding gudgeons on the stern-post of the ship. Two of the gudgeons on the stern-post are shaped to serve as "stoppers," their purpose being to prevent the rudder from being deflected too far on either side when the helm is put over to the full extent. Double plate rudders constructed and fitted in the same manner are used in some of the big liners of recent years.

A large rudder of the ordinary plate type requires an enormous amount of power to move it through the water, and this is provided by a steering engine. The best known type of steering engine is the "telemotor," which is usually fitted in the stern of the ship and above the rudder stock. When the helmsman turns the telemotor steering wheel a pinion attached to it depresses a rack that is connected with the piston of a small cylinder. This cylinder contains a liquid, generally water, and the pressure applied by the descending piston is transmitted through pipes to another cylinder, where it forces out a piston fitted to the control rod of the steering engine. The corresponding movement of this rod opens the control valve and admits steam to the cylinder of the engine. The rudder now turns to the right or left according to the direction in which the control valve was moved. The rudder is prevented from turning to the full extent unless required by means of an ingenious automatic device called the "hunting gear," that utilises the movement of the rudder to cause the control rod to shut off steam at the right moment. The steering engines of large ships are very powerful, some of them developing as much as 750 h.p.

In the endeavour to reduce the amount of power necessary to overcome the pressure of the water, engineers devised the "balanced" rudder, in which a portion of the plate is between the rudder stock and the stern-post of the ship. A rudder of this type is shorter in height and usually of greater width than a single or double plate rudder, but being balanced in respect to the pressure of the water, it can be moved with only a fraction of the power required to deflect an ordinary rudder plate of the same area.



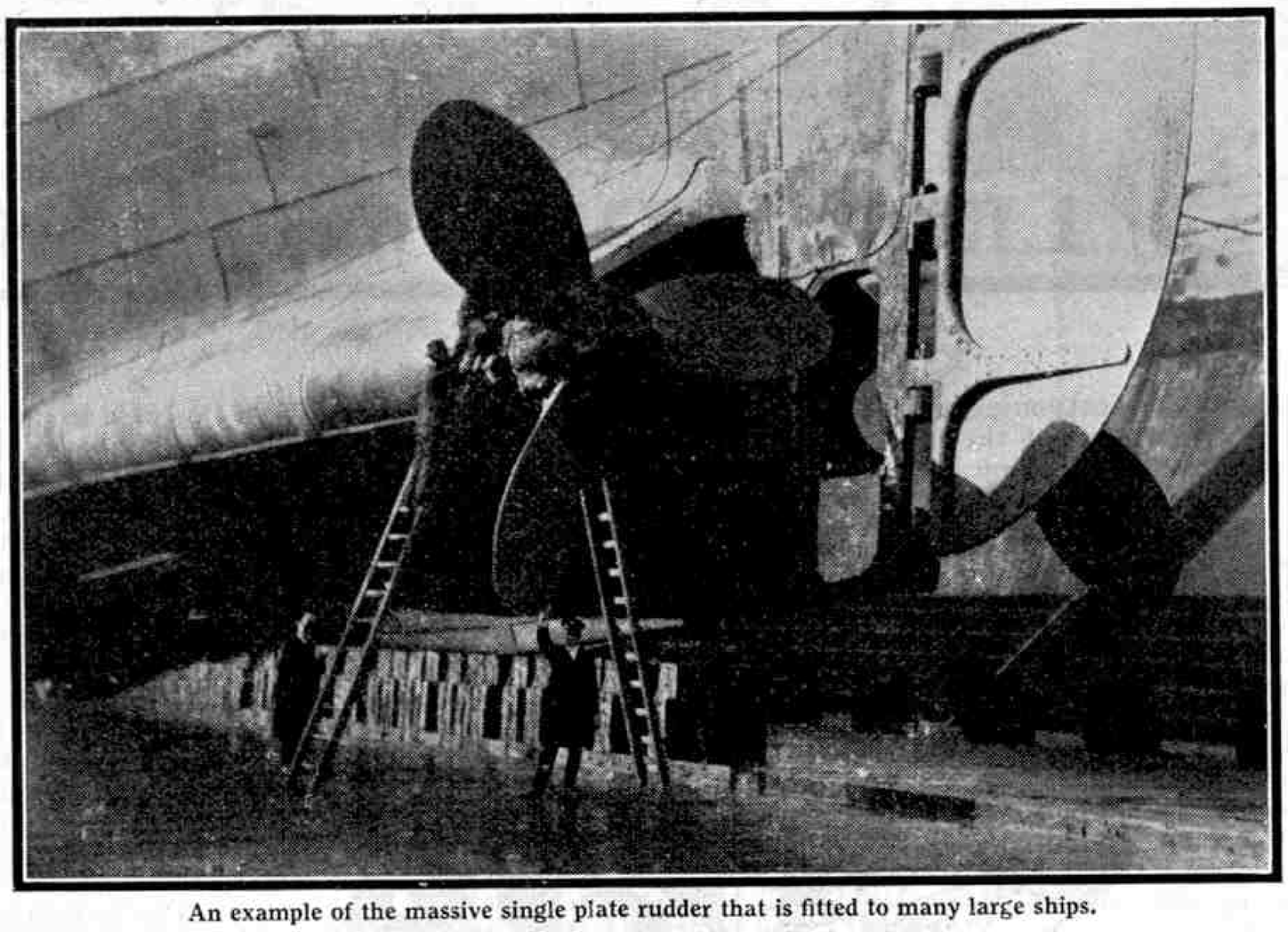
An unusual view of the stern of the Cunard liner "Laconia," showing part of the huge rudder. The projection of the plate forward of the rudder stock helps to balance the rudder and makes it easier to turn.

An interesting development of the balanced rudder principle is the Flettner rudder introduced by Anton Flettner, the pioneer of the rotorship in which rotating vertical cylinders or rotors take the place of the masts and sails of the sailing ship. The Flettner rudder consists of a main balanced rudder with a secondary rudder attached to the trailing edge of it and controlled by the helmsman. Sufficient clearance is provided at the propeller for the main rudder to rotate freely, and its angular position is controlled by the small rudder, for the invention utilises the pressure set up by the stream of water impinging on this rudder. Thus the small rudder steers the large one and the large rudder steers the ship.

The helmsman turns the steering wheel to set the small rudder to the required angle of helm, and the ship begins to turn. This movement immediately causes the stream that until then had been flowing parallel to the line of the keel to flow across it obliquely. The main rudder adjusts itself at once to the changed direction of the stream, keeping itself automatically at the most effective helm angle, and thus making the ship considerably easier to manœuvre. The automatic action of the two rudders enables turning movement to be made without loss of speed and in less space than is possible with the ordinary type of rudder. When the helm is put over to the full extent the rudder is more efficient than a normal rudder, and offers less resistance to forward motion.

Another recent type of rudder and one that is becoming increasingly used is the Oertz rudder, invented by Dr. Eng. Max Oertz, of Hamburg, who is well-known as a constructor of fast yachts and hydroplanes. This rudder is built up of plates and angles and is in two parts, a fixed forepart and a movable back part connected with it. The fixed forepart accounts for about one-third of the length of the rudder.

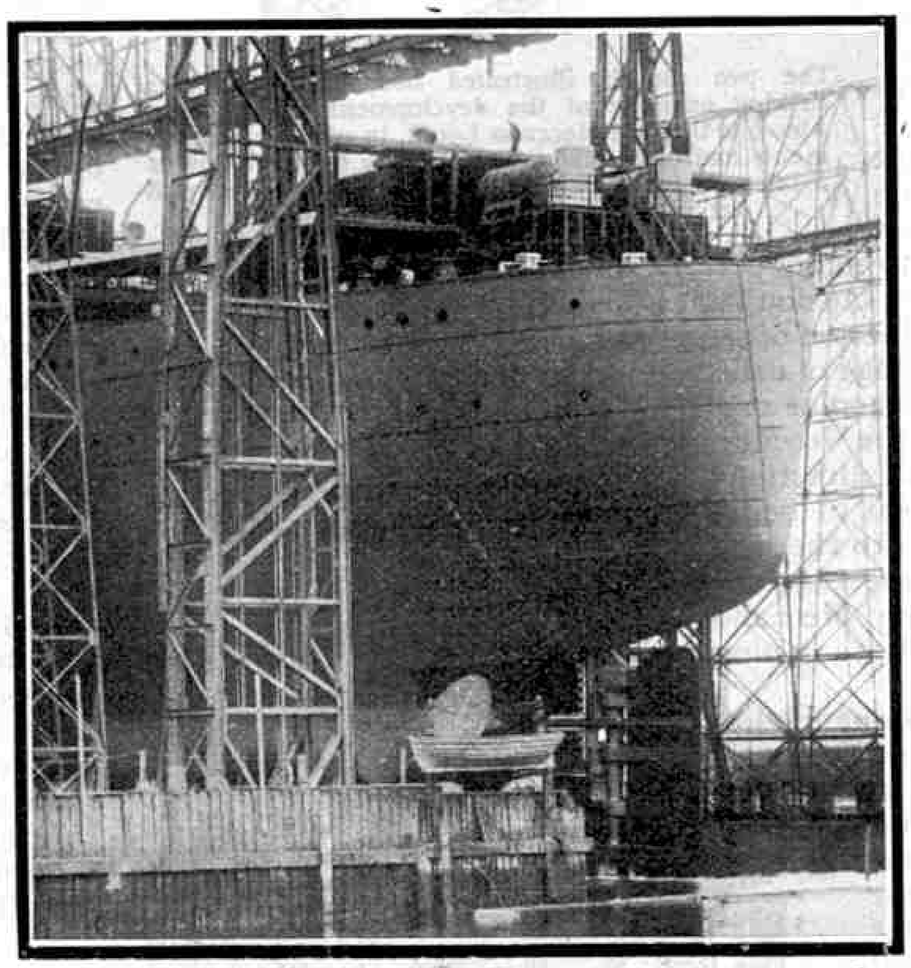
In the normal or midships position the two parts together have a streamline form. The movable part of the rudder is deflected to either side by means of a steering engine and the rudder becomes effective at the smallest angle of helm. The fixed forepart always presents the same aspect to the propeller. As a result there is very little distortion of the propeller stream and eddy currents are greatly diminished, the combined effect being equivalent to a reduction of resistance of about 14 per cent. and a corresponding increase in propeller efficiency. Another important point is that the rudder retains its full steering effect even at very low speeds.



An example of the massive single plate rudder that is fitted to many large ships.

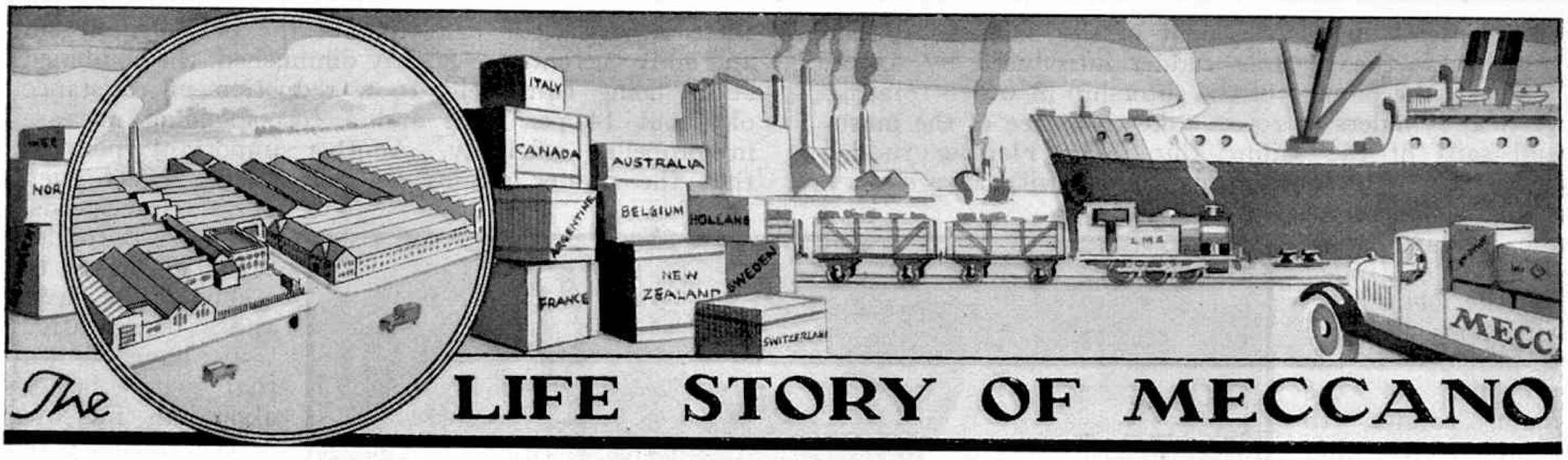
The Oertz rudder can be fitted to a ship in five days, and comparative tests have shown that it brings about an increase in the efficiency of the ship averaging from 8 per cent. upward, without any increase in fuel consumption.

A type of rudder that has been adopted by some of the important shipping companies in Germany and on the Continent is the Star contra rudder developed in connection with the Star contra propeller. This rudder is built up of light plates and angles, and specially shaped plates are attached to it and occupy the space between the rudder stock and the stern-post of the ship. The whole construction is of streamline form and the rudder responds to a very low helm angle. It is claimed that with the star Contra rudder there is an almost complete absence of eddies around the rudder, and that in the case of single screw ships it increases the propeller efficiency by 5 to 15 per cent.



A stern view of the White Star liner "Britannic" during construction. The smallness of the rudder of a modern liner compared to the size of the ship is well illustrated here.

On several hundred ships, ranging from submarines to large liners, the human steersman has been replaced by the Gyro-pilot that, working in conjunction with the Sperry gyroscopic compass, steers mechanically. The master compass detects instantly the slightest deviation of the ship from her set course and transmits it to a repeater motor, which, through differential gearing and an adjustable lost-motion device, turns a roller that is surrounded by contactor rings. The movement of this roller completes an electric circuit and this, acting through electro-magnetic relays, operates a motor that moves the rudder in the direction necessary to return the ship to her set course. The movement of the ship as she responds is transmitted back to the gyro-pilot where, by means of a second lost-motion device, it turns the contactor rings in such a way that the electrical circuit is opened and the motor is stopped. The rapid action of the Sperry gyro-compass and gyro-pilot avoids waste of engine power.



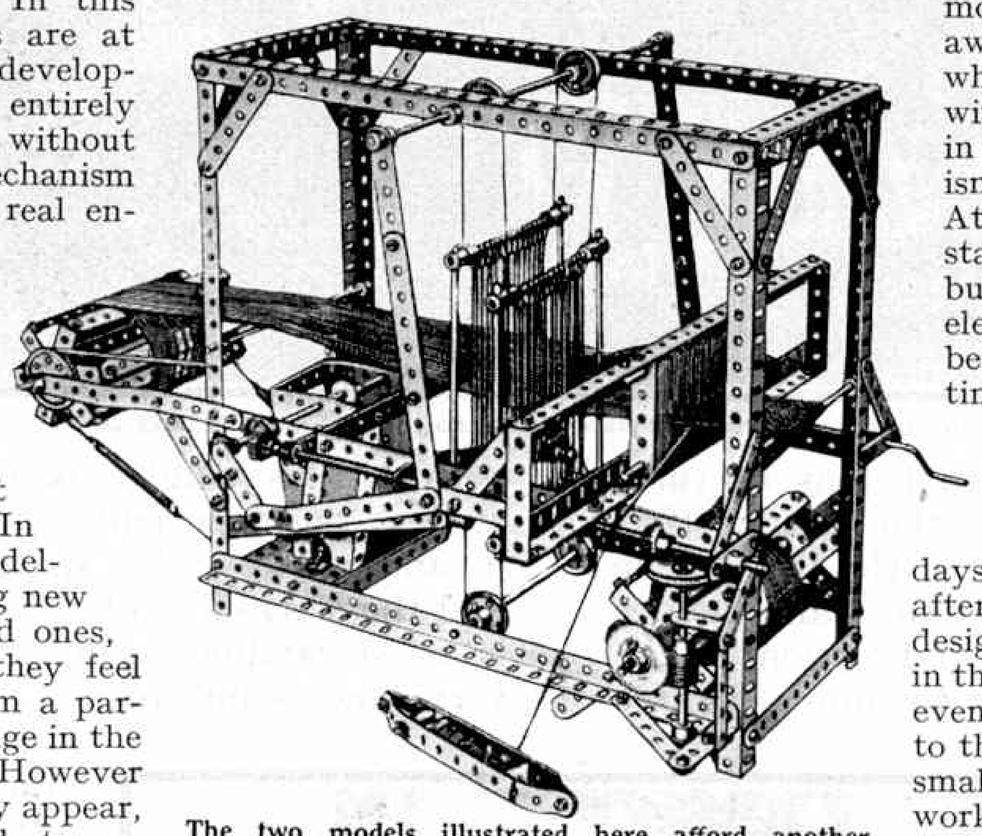
The LIFE STORY OF MECCANO

By Frank Hornby

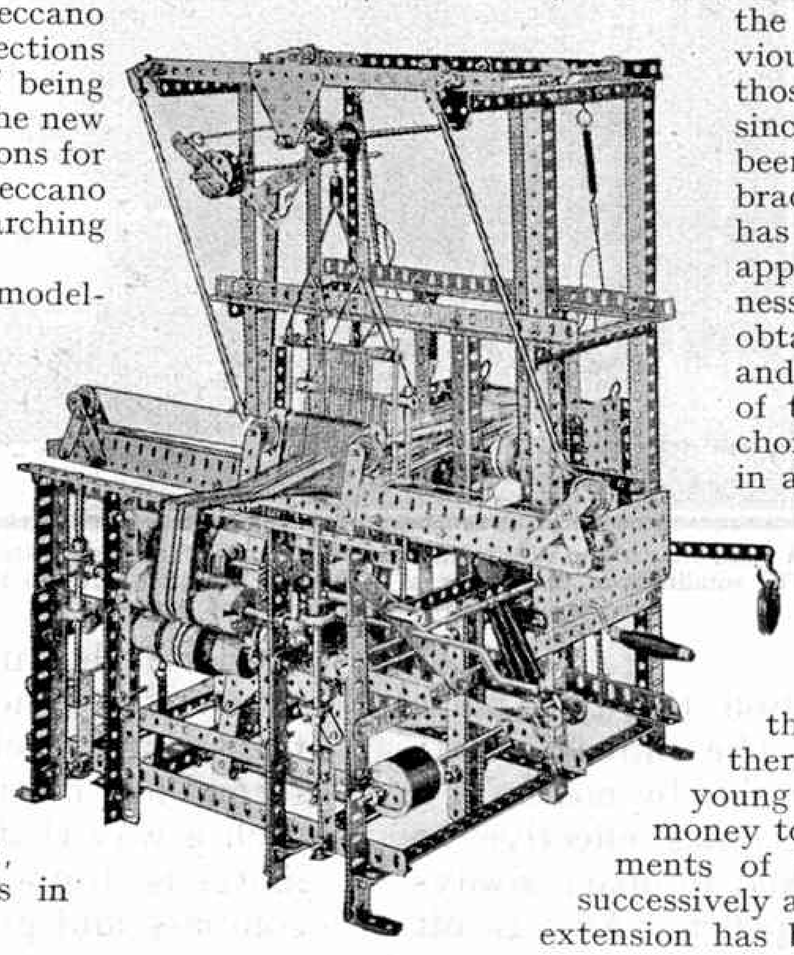
LAST month I stated that I was postponing until later in this series of articles a full description of the Meccano factory, but I feel that I must mention here one of its most highly specialised and fascinating departments—that in which Meccano models are designed and built. In this great room expert model-builders are at work all day long in improving and developing existing models, or designing entirely new ones. Scarcely a month passes without some notable new machine or mechanism being introduced to the world of real engineering, and immediately sufficient details are available our designers set to work to reproduce these inventions in Meccano. In this manner Meccano keeps pace with developments in all branches of engineering.

It is in this department also that proposed new parts are tried out. In the course of their work the model-designers are continually producing new movements, or modifications of old ones, and it frequently happens that they feel the need of a new part to perform a particular function, or for a slight change in the shape or size of an existing part. However attractive a proposed new part may appear, it is not adopted without the fullest consideration. First of all a dimensioned drawing of it is made, and from this a sufficient number of samples are prepared. These samples are then built into a variety of models and tested in every possible way to make certain that the part fulfils the two essential conditions for inclusion in the Meccano System—first, that it is a miniature reproduction of a real engineering part; and second, that it has a wide range of utility, and is not just a "stunt" part for building one spectacular model. If these conditions are fulfilled, the part is added to the Meccano System, which thus extends steadily in all directions without ever abandoning its aim and ideal of being "Engineering in Miniature." In addition to the new parts that are evolved in this manner, suggestions for new parts are received every day from Meccano enthusiasts, and each one is submitted to the searching tests that I have just described.

Another interesting part of the work of our model-experts consists in building, improving and perfecting the models that win prizes in our various competitions. The splendid quality of these prize-winning models has always been a source of the keenest interest to me. The great £500 world contest that has just closed seems likely to surpass all earlier contests in the quality of the entries, and I shall be very busy during the next two or three weeks in supervising the judging of the large number of entries. This contest provides another indication of the remarkable manner in which Meccano is seized upon with the utmost eagerness by the boys of succeeding generations in all parts of the world. As I look at the models submitted, I feel that the engineering of the future is in safe hands.



The two models illustrated here afford another striking example of the development of Meccano. Above is the first Meccano Loom, in which all movements had to be made separately by hand. Below is a later model, in which the movements are carried out automatically by turning the handle.



It is a large part of our business to provide models for dealers to give practical demonstrations of the possibilities of Meccano. These models vary in size according to the window space available, but most of them are very large, and all are fitted with electric motors, so that they are capable of working away for hours on end without any attention whatever. Some of them also are fitted up with electric lights, and at night these lights, in combination with rapidly moving mechanism, form an irresistibly attractive picture. At certain times of the year we have a large staff of model-makers busily engaged in building these models, carefully adjusting the electrical fittings, and testing the mechanism before they are despatched to their destinations.

The activities of our model-building department provide another striking demonstration of the enormous growth of the Meccano System. In the earliest days of Meccano, and in fact for many years after it was first placed on the market, I personally designed and built every model that appeared in the Meccano Manuals of Instructions. To-day, even if I were to devote the whole of my time to this work, I could not carry out more than a small fraction of it. Even now, however, the work of model designing is carried out under my direct personal supervision, and all doubtful matters are referred to me for decision. I have never relaxed my determination that every model associated with the Meccano System should be designed and constructed on correct engineering principles. I have always attached the utmost importance to this accuracy, and as a result Meccano to-day plays a unique part in the development of sound engineering knowledge.

In 1926 occurred the 25th anniversary of the introduction of Meccano, and it was distinguished by an outstanding event, namely the introduction of Meccano in colour. Previously all parts of the Meccano System, except those made of brass, were finished in nickel; since that time plates and pulley wheels have been enamelled red, and strips, girders and brackets green. The use of these coloured parts has brought about a great improvement in the appearance of models by introducing a brightness and realism that previously could not be obtained. This step was taken only after long and careful consideration, but the popularity of the decision was shown by an immediate chorus of approval from Meccano enthusiasts in all parts of the world.

Meccano is made up for sale in a number of outfits of various sizes, which have been developed year by year from the single outfit in which my invention first appeared. Gradually the number of outfits grew until they ranged from No. 1, the smallest, to No. 7, the largest. Then there arose a demand for smaller outfits for young boys who had the Meccano spirit but little money to spend; and in order to meet the requirements of these boys there have been introduced successively a No. 0, a No. 00 and a No. 000 Outfit. No extension has been made at the other end of the scale,

for the No. 7 Outfit contains a complete miniature engineering equipment, capable of reproducing practically every type of structure and mechanism.

In planning these outfits my guiding principle has been that of steady and gradual progress from small things to great, without any gaps, overlappings or difficulties of any kind occurring between the various stages. For instance, a boy may purchase a No. 1 Outfit. He takes this home and gradually works his way through the models shown in the Manual of Instructions contained in the Outfit. Presently he turns his attention to the more elaborate and more interesting models that he sees grouped together on two pages at the end of the Manual, and he becomes eager to build these. He is unable to do this at present, however, because he lacks various parts; these larger models require larger outfits. In the ordinary way the purchase of a No. 2 Outfit, the next larger, would involve this boy in acquiring a number of parts that he already possesses. Therefore, in order to avoid the unnecessary cost thus incurred, what are known as "Accessory" or "A" outfits have been prepared to provide bridges leading from one standard outfit to the next higher. Thus a boy who has a No. 1 Outfit, and wishes to convert it into a No. 2, may do so by purchasing a 1A Accessory Outfit, and thus acquiring all the new parts he needs without any useless expenditure on parts that he already possesses.

The room in which "Mechanics Made Easy" parts were assembled for packing into Outfits.

A boy who contents himself with building the models that are illustrated and described in the Meccano Manuals of Instructions inevitably gains a sound general knowledge of engineering design and principles, but very few boys stop there. From the time when a boy first commences to use Meccano he has before him a constant encouragement and stimulus to make slight changes in the construction of the various models. From this he is led on almost imperceptibly to build models entirely from his own ideas, and then he has become, in the true sense of the word, an inventor.

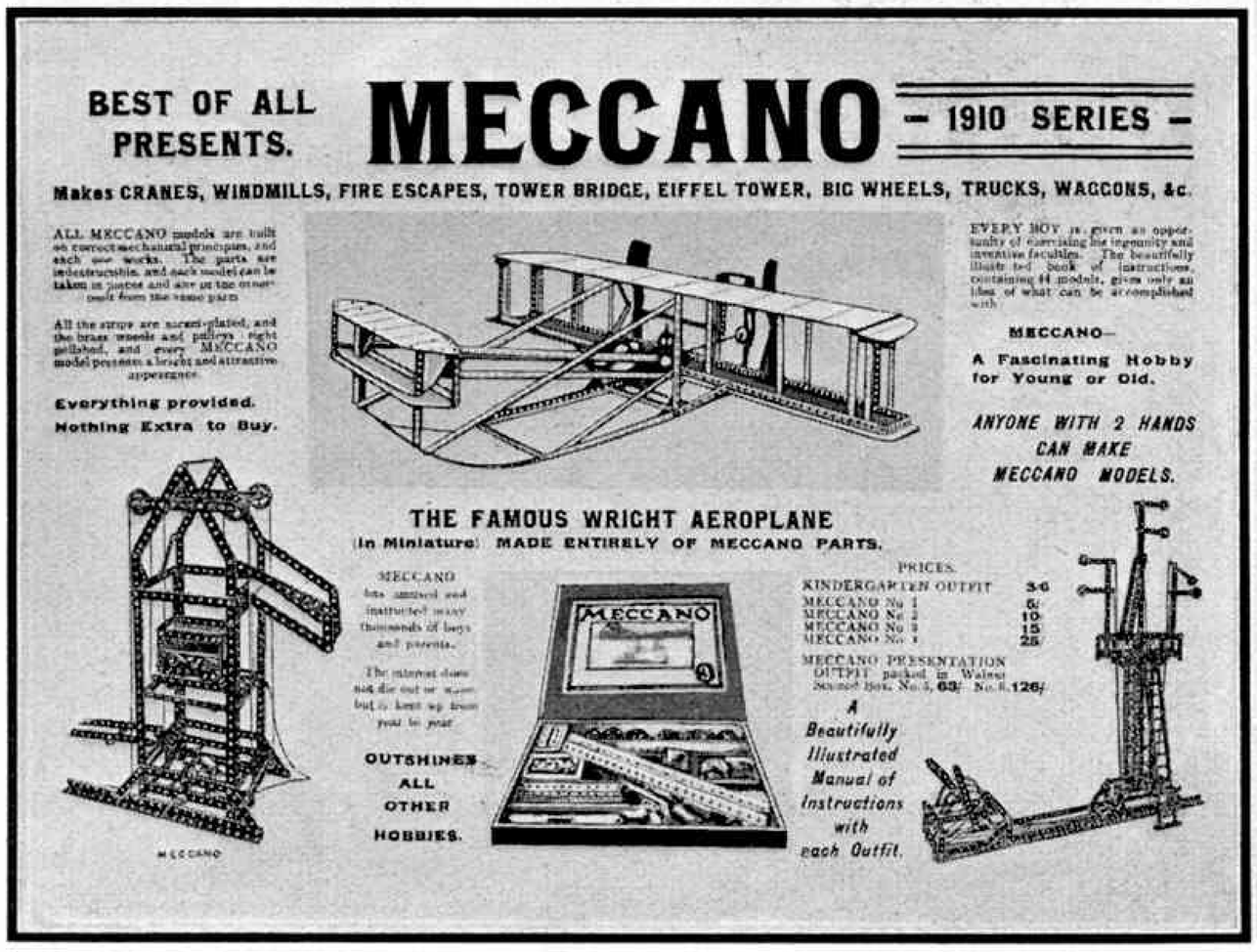
The educational value of Meccano does not end here, however; it extends to every boy, even those who have no special aptitude for engineering, and who certainly have no intention of taking up engineering as a career. Every boy is interested in knowing "how things work," and why they work in their own particular manner. Until recent years boys who wished to understand how the world's giant engines and machines work had to be content with book descriptions; but Meccano has brought about a revolution in this respect. By means of Meccano a boy can build miniature models of an almost endless variety of engines and machines; and these models actually work on the same principles as the originals. The result is that, instead of a vague and often inaccurate idea of the most important mechanisms, the Meccano boy has a real and definite knowledge of how these work—a knowledge that, once gained, is never lost.

A very striking illustration of the practical nature of the education provided by Meccano is to be found in schools for the blind. It is naturally an extremely difficult matter to convey by description, to a boy who has been blind from birth, a true conception of, say, a motor car. If, however, Meccano models of a gear-box, differential gear, steering mechanism, etc., are placed before him, so that he can handle each unit separately and follow by the sense of touch its incorporation in the chassis, he can gradually build up a mental picture of the complete car. He can actually feel the difference in the drive obtained by changing the gears in the gear-box; he can feel the clutch gradually take up the drive from the engine; and he can note exactly what happens in the differential as a car turns a corner. Then, when next he hears a motor car start up, or change gear to negotiate a steep hill, he can visualise exactly what is happening. In a similar manner a blind boy may acquire exact knowledge of a wide variety of engines and machinery.

Quite apart from all these advantages Meccano plays a wonderful part in training the hand and the eye to work together efficiently. This is the case from the very first. Even the smallest boy who sets out to build a simple model has to think and make decisions at every step. When, in the course of building, another part is required, he has to decide which part it is, where it is to be placed, and how it is to be fitted and fixed in position. This mental process continues throughout the building of every model, and quite unconsciously the Meccano boy acquires a habit of first thinking out a problem and then coming to a definite decision—a habit that is of the greatest possible value to him in later life. While he is acquiring this habit the Meccano boy is learning the value of form and design, and that the different members of a crane or a bridge are not inserted haphazard or merely for the sake of ornament, but to serve a definite purpose in resisting some stress or strain, and in adding to the combined strength of the whole structure.

Further proof of the fact that Meccano is real "Engineering in Miniature" is afforded by the extensive and increasing use that is made of it by inventors, many of whom write to express their high appreciation of the assistance it affords them in making models and mechanisms of all kinds, and thus translating their ideas into practice. The same appreciation is expressed also by engineers and engineering firms who make use of Meccano regularly in their every-day work. Other letters come from science masters and masters in technical colleges, who find that their ever-changing requirements in models and apparatus are fulfilled by Meccano in a unique manner.

I am very proud of these testimonials to the efficiency of Meccano. They show that, although it is primarily a constructional toy, it is based on such sound principles that there are practically no limits to its possible extension. Next month I hope to refer to a few of the most notable instances in which Meccano has proved itself of service.



Reproduction of a Meccano advertisement that appeared in Gamages Catalogue, 1910.

SKY-WRITING with smoke pouring from an aeroplane is an English invention, 20 years old, and the inventor and his pilots still remain the only sky-writers in the world. The sky message has considerable commercial value as an advertisement. It is written at a height of between two and three miles at a speed of never less than 100 m.p.h., with a fighting type of aircraft of war-time design, known to airmen as the S.E.5. The letters are each half-a-mile in height. A message, usually consisting of one or two words, is between five and ten miles in length, and can be seen and read over an area of 100 square miles.

To make the sky message read in the natural way for the public gazing from far below, it is necessary to write backward, from right to left, and in order to prevent the wind from scattering the smoke too soon the writing must be done as quickly as possible. Another reason for speed once the message has been started is that a high wind will blow it along, and the sky-writer will finish miles beyond the selected area.

Contrary to the popular impression, a perfect calm is not essential for sky-writing, although conditions that produce the effect of calm air upon a machine are essential. Before the sky-writer starts he flies about in the higher regions seeking an air stratum in which his machine will fly steadily with his hands and feet off the controls. Now this condition is possible not only in a perfect calm, but in an area in which the wind is blowing steadily in one direction all the time. It may be blowing at gale force, but that will not prevent smooth writing. Bumpy air is the condition that must be avoided, for it will rock the machine and shake the message. English weather is unfavourable for sky-writing, not because it is mainly blustery, but because visibility is bad. In a country of sunshine like Italy visibility is always good, but the cold air rushing down from the northern ranges meets the hot air rising from the valleys and causes very bumpy conditions.

In order to keep the sky message straight and the letters the same size, the pilot counts all the time, and thus knows exactly when a correct height has been flown. Owing to the large size of the letters he cannot see them all as he writes, and therefore they do not help him, except that when the sun is shining their shadow is occasionally a guide.

Script writing is generally easier than block lettering, because the letters are joined, and the pilot has not to cut off the smoke and make for a certain position to start again. With block lettering the gaps are several hundred yards in width, which means plotting directions and distances before leaving the ground so that no time is lost by flying in the wrong direction, or by hesitating. The message is always closely studied before leaving the ground, and a detailed plan made to prevent mishaps.

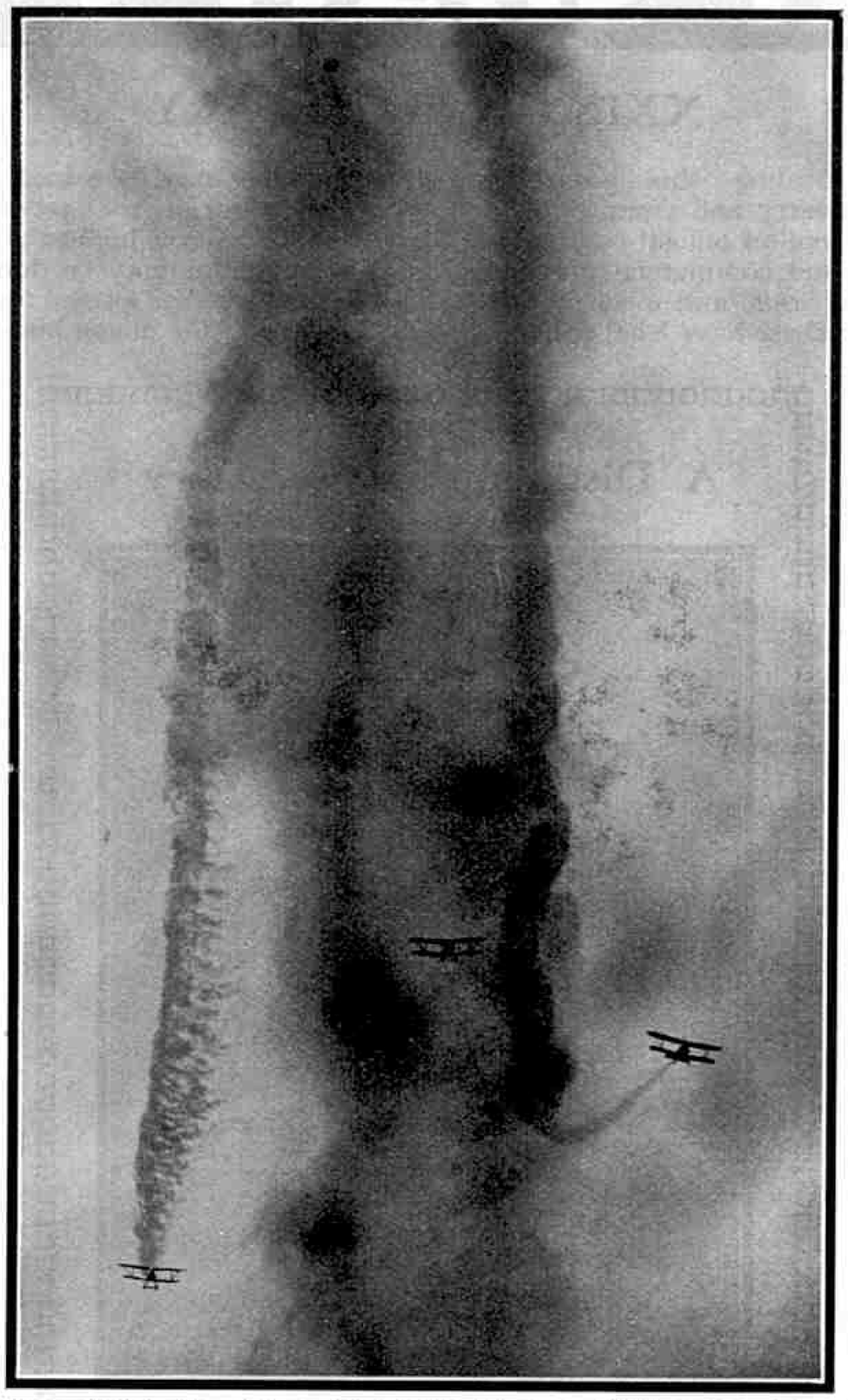
It is the size of the message and the speed at which it must be done that make this peculiar form of flying more exacting than might be imagined. It does not involve daring aerobatics. Straight strokes naturally mean straight flying and the curves require banked turns of considerable radii; so that excellent judgment and steadiness on the controls are more important than aerobatics. The outlines of the letters must be drawn without constant play on the rudder to keep the nose of the machine on the "line,"

A good example of a completed sky sign that would be visible over a very large area.

otherwise the writing would be zig-zag. This means placing the machine in the correct direction when beginning each part of a letter and not varying it on the way. Aerobatics are certainly useful in getting from one position to another in the shortest possible time when not actually writing. A pilot who could only perform the elementary manœuvres would be a slower sky-writer than an aerobatic pilot.

Although the sky message is only begun in the suitable air stratum, the pilot must be wary of the wind, particularly if it changes. It can play havoc with his attempt to write straight, and it has been known to turn a message completely round without disarranging it, so that it read backward from the ground. During training sky-writers are taught to write parallel lines in the air, and they will often be convinced of their success until they land and survey the result! They may actually have written parallel lines, but while they were finishing the last line the wind has bent the top ones down or up.

As the sky-writing apparatus is the secret of the inventor, and is protected by patents throughout the world, it is only possible to give a broad conception of its function, but that is sufficient to give an idea of the process. Smoke chemicals are carried in tanks fitted in front of the pilot's cockpit, and are passed in certain proportions to a mixing chamber, which is heated by the aero-engine exhaust. By this process the smoke is created. It then passes through a pipe about 3 in. in diameter, which ranges along the starboard side of the fuselage to the tail unit, and is well insulated. It may be wondered how the volume of slipstream sweeping off the tail unit from the airscrew is prevented from dispersing the smoke as it is emitted. The only precaution required is to have the smoke issuing in the centre of the slipstream volume as far as possible.



Gloster "Grebe" machines of the R.A.F. giving an exhibition of aerobatics with different coloured smoke. This photograph is reproduced by courtesy of the Editor of "Flight."

This apparatus does not impose an additional duty upon the pilot, other than turning the smoke on and off. The smoke itself is quite harmless, and leaves no odour in the air. The pilots do not pass through it when writing, although they seem to do; but if they did it would have no effect upon them. The nearest they approach to it is when making a skilful join in a letter by running the undercarriage wheels through the top of the smoke, but this feat cannot always be achieved.

A bad join may not be visible to eye-witnesses vertically below, but those watching at an angle, several miles away, will detect it. Losing altitude while writing is the fault to be wary of to prevent bad joins. The smoke apparatus imposes an additional load of 250 lb. upon the aeroplane, and the specific performance required of a sky-writing machine is a speed of over 100 m.p.h. at 10,000 ft., with the load of chemicals as well as sufficient fuel. The old war-time S.E.5 single-seater fighter was found the most suitable type of aircraft 10 years ago and it remains so, although the pilots who write in the sky are not now using machines that actually flew in the Great War. Major J. Savage, the English inventor of this unique advertisement display, operates a fleet of 32 S.E.5 fighters to-day. It is the largest civil air fleet in the country, as well as potentially a fighting unit. More modern, though obsolete, types of fighting aircraft could do this work, but they are too expensive, while no modern type of civil aircraft exactly exhibits the required performance. An S.E.5 is a small biplane driven by a 300 h.p. water-cooled engine.

Sky-writing can provide a spectacular event in an air display, as those who have witnessed the remarkable Air Force Pageant at Hendon may agree; and the writer suggests that in war a pilot might escape from a tight corner by retreating behind a smoke screen blown from his own machine, in the same manner as do battleships. Its commercial value in time of peace, however, is as a special and ingenious advertising display. If it be true in practice that an advertisement is valuable in proportion to the amount of attention it attracts, then the sky message, with its effective area of 100 square miles, is seemingly worth its cost; but at the same time this cost is only within the means of a national advertiser. The expense of operating an aircraft fleet is responsible for placing it beyond the means of ordinary advertisers.

When the American Tobacco Company decided to test the pulling power of sky-writing, they absorbed a large percentage of their advertising appropriation for one year to have the name of one of their popular cigarettes written over 300 cities, which involved 250,000 miles of flying. The result was a very satisfactory increase in sales.

There is more sky-writing in America, Germany and the small European states than in England, partly due to our unfavourable weather, but also, it is said, to the conservatism of British advertisers. The sky-writers do not despair of this country, however. They believe that the growing tendency to restrict poster advertising, in the cause of preserving the beauty of our countryside, will divert a promising interest to the sky-message.

Prospective advertisers have sometimes been dubious about the brief time the message is engraved upon the sky. But the man in the street wants his attention attracted only so long as it takes him to read the message, or to watch it unfold. He does not care how long it can be read.

XXIX.—A SECRETARY

THE career with which we are dealing this month is connected with all branches of industry and commerce, for practically every enterprise must have an official to organise office work and to deal with any legal and commercial problems that may arise. This applies to private firms, and even more to companies, whether private or public, for these have legal responsibilities that are the immediate concern of the secretary. The activities of such an official are therefore widespread and offer scope for the exercise of many qualities.

In many concerns the secretary is fully occupied in office work and in general business transactions. He supervises the book-keeping and accountancy departments, and conducts a large proportion of the general correspondence, while often being responsible for the organisation of commercial activities. In larger firms his responsibilities become greater, and he delegates some of the routine duties to subordinates in order to devote more time to business matters of a special character. If he is the secretary of a company, it is his duty to see that all the necessary legal requirements are complied with, and in particular he is responsible for keeping the accounts of the company correctly, and for ensuring the accuracy of the registers of members or shareholders. In such concerns he usually is in close touch with the directors, whom he must advise on legal questions and matters of general commercial practice. He prepares agendas for directors' meetings as well as for meetings of the company, and in many cases his work is so valuable that he may even become a director himself.

It will be seen, therefore, that many qualifications are required of the ideal secretary. In addition to having a complete command over the technicalities of his profession, he must be quick and capable in negotiations, and his judgment on commercial affairs must be sound. This often implies knowledge of economic and commercial conditions abroad as well as in his own country. In the words of one with great experience of the requirements of positions of this kind : " A secretary is expected to have a wider range of business accomplishments than probably any other official, for not only must he be a good correspondent and understand accounts, but he is looked to for guidance in legal matters at the preliminary stage and in matters of organisation and general policy, so that he must keep continually abreast of affairs. Coupled with all this, the tactful handling of delicate situations and an evenly balanced temperament are also requisites which will help him to the highest place in his profession."

In order to reach the position of secretary, it is necessary to undergo preliminary training in office routine and secretarial work generally, and at the same time to acquire the range of knowledge of legal matters, accountancy and commercial practice required. The first step therefore is to enter a suitable office in which a wide experience may be gained, and to follow this up by the hard work and application that secures promotion to responsible posts, and ultimately to the highest post of all, that of the recognised secretary. Although this may be done independently, it is advisable to join one of the bodies formed for the benefit of members of the secretarial profession, for these bodies not only give professional standing to their members, but also lay down regulations for training of such a character as to ensure the possession of complete qualifications for secretarial posts.

A Distinguished Secretary

Mr. F. R. E. Davis, O.B.E., President of the Chartered Institute of Secretaries. Mr. Davis is also a Fellow of the Chartered Surveyors' Institution and of the Royal Economic Society, and has qualified for the Bar. He became associated with the Great Western Railway Company in 1902, and has been secretary of the Company since 1926.

The first move towards organising associations for secretaries was made in 1892, when the importance of the work of these officials in the organisation and conduct of businesses of all kinds became sufficiently distinctive and important to warrant such a step. In that year an Institute was formed that rapidly attracted those concerned with the profession, and became so successful that in 1902, only ten years later, a Royal Charter of incorporation was granted to it. Thus it became the Chartered Institute of Secretaries, which to-day has a membership of nearly 7,000. Membership is secured by means of examination tests in secretarial practice, accountancy, economics and law, coupled with the further test of a period of service in which the necessary practical office and secretarial experience is gained. There are two degrees of membership. Associates of the Institute include those who have passed the required series of examinations and have served in the office of a recognised company or firm for a period that usually must be at least six years ; and they are entitled to make use of the letters A.C.I.S. in order to indicate their qualifications. Fellows of the Institute, who are distinguished by the use of the initials F.C.I.S., are those who have served a further period of at least three years, and at the time of their application for election are practising as secretaries or assistant secretaries. Further details of the Chartered Institute may be obtained from the Secretary, 6, London Wall, London, E.C.2.

The formation of the Chartered Institute of Secretaries was followed in 1907 by the founding of the Incorporated Secretaries Association. This Association also conducts examinations, and practical service forms one of the qualifications for membership ; while its Associates and Fellows are entitled to make use of the initials A.I.S.A. and F.I.S.A. respectively. Full details of the Association and the regulations for studentship may be obtained on application to the Secretary, Secretaries House, 21, Bedford Square, London, W.C.1.

Although, as already pointed out, it is not absolutely necessary that all those who wish to take up secretarial work should join one of these bodies, it is advisable to do so, for membership is a proof that a thorough training in secretarial practice has been obtained. There is the further advantage that both bodies hold meetings

and conferences for the discussion of matters relating to the profession, and their members also are kept in touch with developments by means of official publications. These publications include "*The Secretary*," issued monthly by the Chartered Institute of Secretaries, and "*The Incorporated Secretaries Journal*," which also is published monthly. Students who have been registered with one of these societies are entitled to attend its meetings and lectures, to make use of its library and also receive copies of its journal. Thus they are brought into contact with the realities of the profession. Membership of one of the two bodies therefore may be regarded as essential to those who wish to achieve success, and it is noteworthy that there is a tendency to-day to fill the highest secretarial positions from their ranks.

This brief survey of the duties of a secretary will help boys who have this career in mind to decide whether their abilities are suited to posts of this kind or not. If possible a decision should be made before leaving school for, as a wide range of many subjects is required, together with the power to deal with new situations as they arise, a thorough all-round education is essential. This may be obtained at a good public or secondary school, and while the subjects taken may be those in which the future secretary is most interested, they should include English, mathematics, a foreign language, and either geography or history. As usual in preparing for one of the professions, the matriculation certificate or one of equal standing should be obtained, for the possession of such a certificate exempts candidates from the preliminary examinations of the Chartered Institute of Secretaries and the Incorporated Secretaries Association. Those who are unable to obtain a qualification of this kind may take one of the preliminary examinations organised by the Societies themselves. In each case the preliminary examination follows the lines of those usually taken on leaving school.

It is often suggested that a boy who aims at a good secretarial post should secure a University training and take a degree in commerce. This is excellent advice, and should be followed if at all possible, for it gives a young man a wide outlook and helps to develop the ability to mix freely with others, a great advantage in the negotiations and discussions that often are necessary in commercial life. A further advantage is that a young man with a University training grasps the principles involved in his career quickly and easily, and is able to appreciate their meaning and importance better because of the background of knowledge he has gained.

The next step in taking up a secretarial career is to enter a suitable office and to apply for studentship of the professional body selected. In the case of the Chartered Institute of Secretaries, a student must be not less than 16 years of age, and must be recommended as suitable by a member of the Institute, or by a person of official standing. He must also be engaged in an approved office, or be undertaking a course of instruction in an approved School of Commerce with the object of preparing for the examinations of the Institute. A qualifying period of clerkship of six years is required for election as an Associate of the Chartered Institute.

It should be noted that there is an alternative to this means of registering as a student of the Chartered Institute of Secretaries. As in other professions of this type, those embarking on a secretarial career may become articled clerks to a Fellow of the Institute, and in that case only four years' service is expected, instead of six. In this case the student is placed under the direct supervision of a practising secretary, who is expected to provide a systematic course of training. It is laid down that this training should include not only periods spent in general office work and accountancy, but also a year devoted to assistance to the secretary himself. Direct contact with an experienced man, and the opportunities of following his activities, are great assets, and if possible the years of studentship should be spent in this manner.

A further interesting point is that the period of service under articles of a graduate of a University is only three years, instead of four. Concessions also are made to graduates, and those holding legal or similar qualifications, in connection with the intermediate examination, the second of the three tests that qualify for Associateship of the Chartered Institute. The number of subjects of the intermediate examination is seven, but these may be reduced to four in the case of a candidate holding certain qualifications, the subjects in which he is exempted being those of the degree or equivalent qualification that entitles him to exemption.

In the case of the Incorporated Secretaries Association those who wish to register as students must be 16 years of age, and must be engaged in the office of a limited company, public authority, or society, or be undertaking the necessary instruction in professional subjects in preparation for the examinations of the Association.

The Council Chamber in Secretaries House, the headquarters in London of the Incorporated Secretaries Association.

As in the case of the Chartered Institute, an alternative is to serve articles with a member of the Association. The period of service as an articled clerk must be at least five years, unless the articled clerk is a graduate of a University, in which case the period is reduced to three years. Registration is only granted to those who have passed the preliminary examination of the Association, or an equivalent examination, and satisfactory evidence of character also must be produced.

The entrance to Secretaries House, London. For the illustrations on this page we are indebted to the Incorporated Secretaries Association.

When a young man has been accepted as a student of one of the professional bodies, his time is spent in office work and in studies for the intermediate and final examinations. These are professional in character, and the subjects are related to his daily occupation. Further study is necessary, however, and it is usual to attend classes held at Schools of Commerce. A student cannot take the final examination until he has reached the age of 21 years. Success in this gives him the right to apply for admission as an Associate of the professional body to which he aspires, and on his election he is entitled to regard himself as a fully qualified secretary.

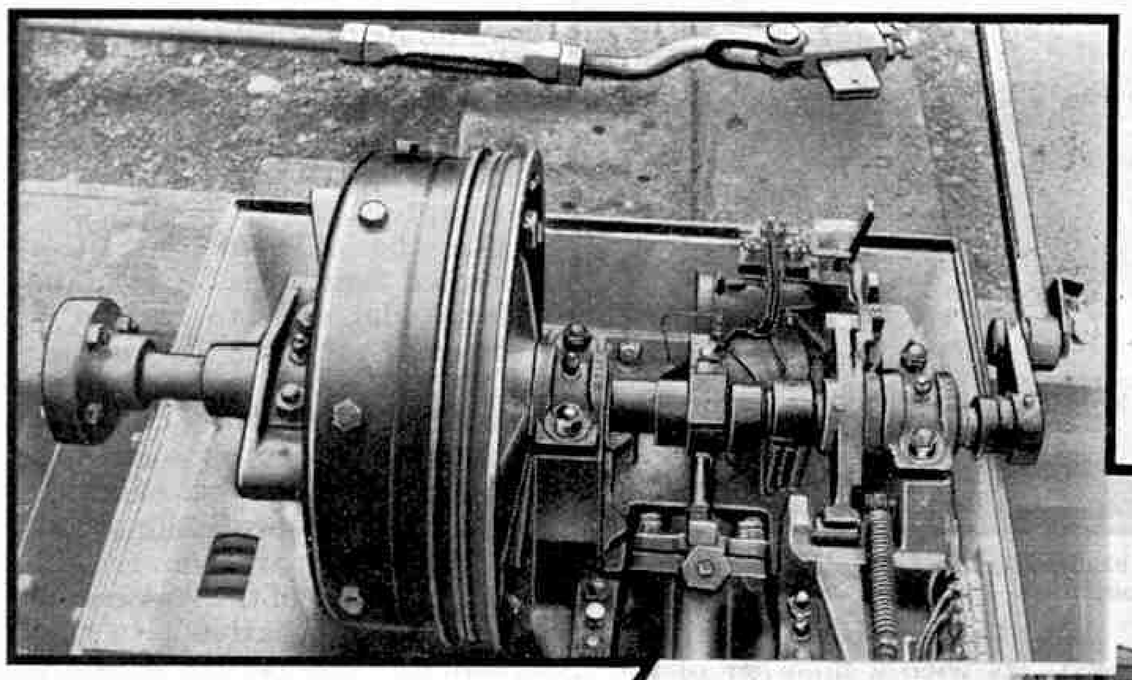
It is difficult to give any definite account of the prospects of one who has qualified for a secretarial position, for the field of work is very wide. As a rule the previous career of a newly-qualified secretary has brought him into contact with a circle of business acquaintances, and these may help him in finding a suitable position in which to make use of the knowledge and experience he has gained. It is not always necessary to seek openings in this manner, of course, for there may be excellent opportunities for advancement in the office of the firm with which he has served during his years of studentship. In any case ability and energy must be added to the official qualifications if promotion is to be obtained, or appointments to responsible and highly-paid posts secured.

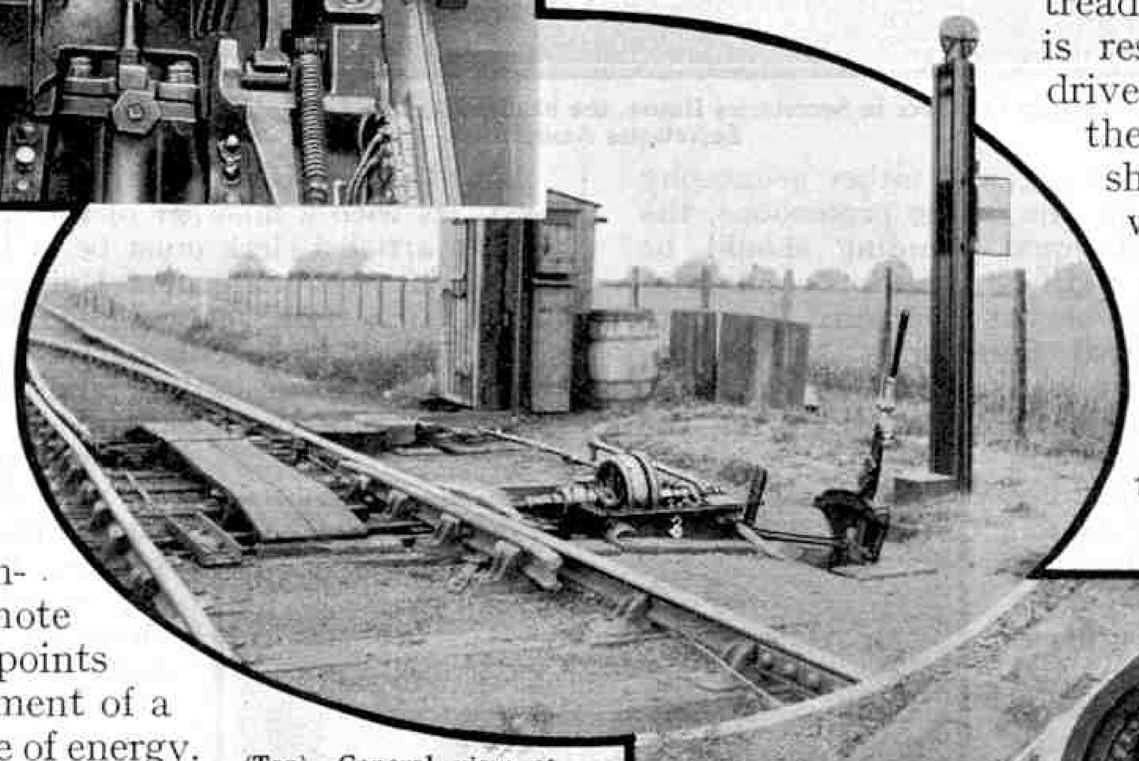
In purely routine secretarial work alone there are openings for the exercise of energy and initiative, and in many cases possession of these qualities is recognised by appointments to directorships or special posts in which the judgment and professional knowledge of a secretary may be directly applied in deciding on questions of policy. Such work carries with it great responsibilities, and naturally those capable of undertaking it command high salaries.

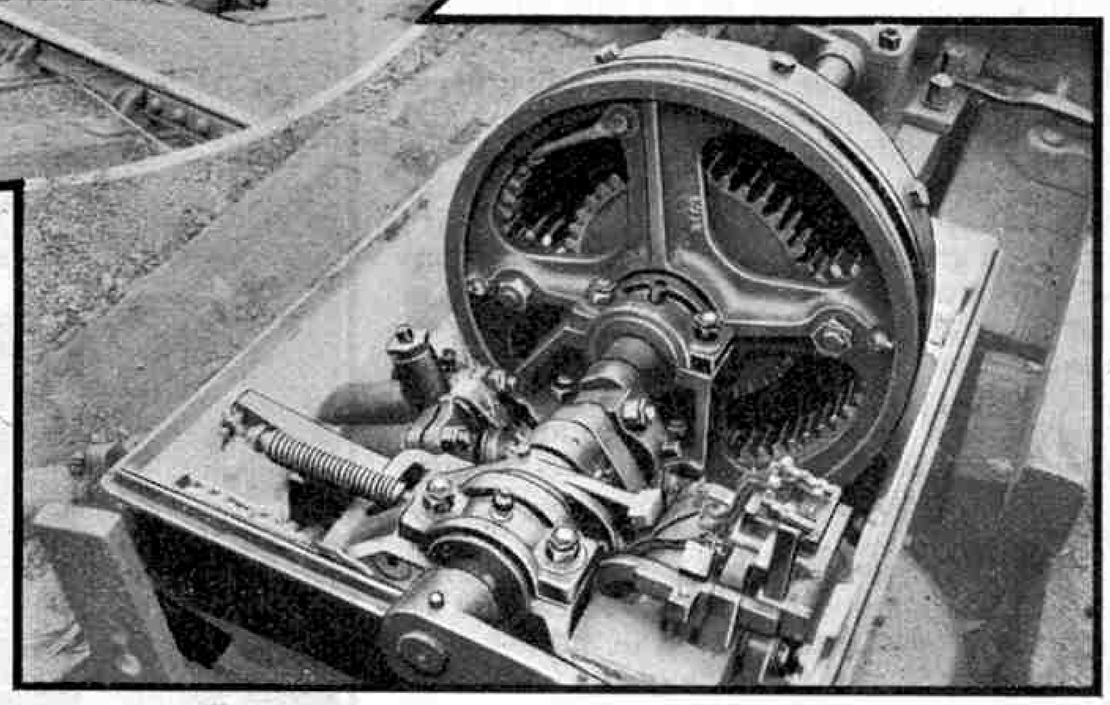
Electro-Gravity Points Operation

How the Sheremeteff Machine Works

THE past 10 years have witnessed a marked advancement in the methods adopted for the remote control of points. Manual working distance limits have been increased by the introduction of the double wire system. Various types of battery-worked points machines have been produced, some of which are capable of operating two pairs of points simultaneously in a period of four or five seconds. Electric hand generator equipment also has been evolved, rendering possible the remote operation of electric points machines without the employment of a battery or other external source of energy.







(Top). General view of the Sheremeteff Points Machine. (Centre). The layout of the apparatus as in actual use. (Below). View of driving drum, showing geared connection to main shaft.

At Skillington Road Junction on the Highdyke-Stainby ironstone branch line, the L.N.E.R. have now applied an electro-gravity points machine that has been supplied by the British Power Railway Signal Co. Ltd. The equipment consists essentially of a short rail treadle and a machine for converting the treadle impulses into rotational action. The treadle is depressed by each wheel passing over it, and the rotational action is utilised to wind an attached steel cable upon a drum. The other end of the cable is directed by pulley guide wheels over a vertical post, which supports and guides a heavy weight, and to which the cable is attached. The machine is also arranged to convert the energy stored in the raised weight into points-throwing effort when an electrically-operated release is actuated.

The details of the mechanism are as follows. A short rail treadle, capable of being independently depressed about $1\frac{1}{4}$ in. by each vehicle wheel passing over it, is connected up to compress a powerful spiral spring, the function of which is to transmit—on resuming normal dimensions—a uniform impulse to a pair of internal extending lever drivers. These drivers in turn impart a unidirectional turning moment to the winding drum. A pair of similar internal extending levers, acting as clutch to the drum, ensure the non-return of the drum under the agency of the stored energy.

The winding drum is in two sections, the driven, and the driving parts. The driven portion, operated as already described, is provided with cogging around the inside of the periphery, which meshes with two idler pinions carried on the spokes of the driving drum. Attached to the latter drum is a flexible steel rope, which, as a result of treadle impulses, is wound upon the drum. The other end of this rope is wheel-guided to and up a vertical post, and attached to a guided weight that is elevated as the wire is wound on the drum.

The tendency of the raised weight is to turn the driving drum in the reverse direction to that imparted by the treadle impulses. This tendency is resisted by the clutch on the driven drum and a cam lock on the main driving shaft, which shaft terminates in a gear wheel meshing with the idler pinions carried by the driving drum.

The lock on the main driving shaft can be released, permitting half a revolution travel (representing 9 in. throw on the external crank), and one points movement, by the energisation of two electro-magnets. These magnets, when energised in appropriate sequence, admit of mechanical escapement, and the semi-rotation of the main shaft results. The main shaft carries a commutator that functions as a polechanger, interrupting at each half revolution the electrical energy feeding the electro-magnets, and setting up the circuit ready for a subsequent movement. After the locks controlled by the electro-magnets have resumed, by spring control, the normal or locked position, a cam on the main shaft restores the locking member to its normally engaged position.

The force with which the points are (*Continued on page 314*)

Modern Methods of Pile Driving

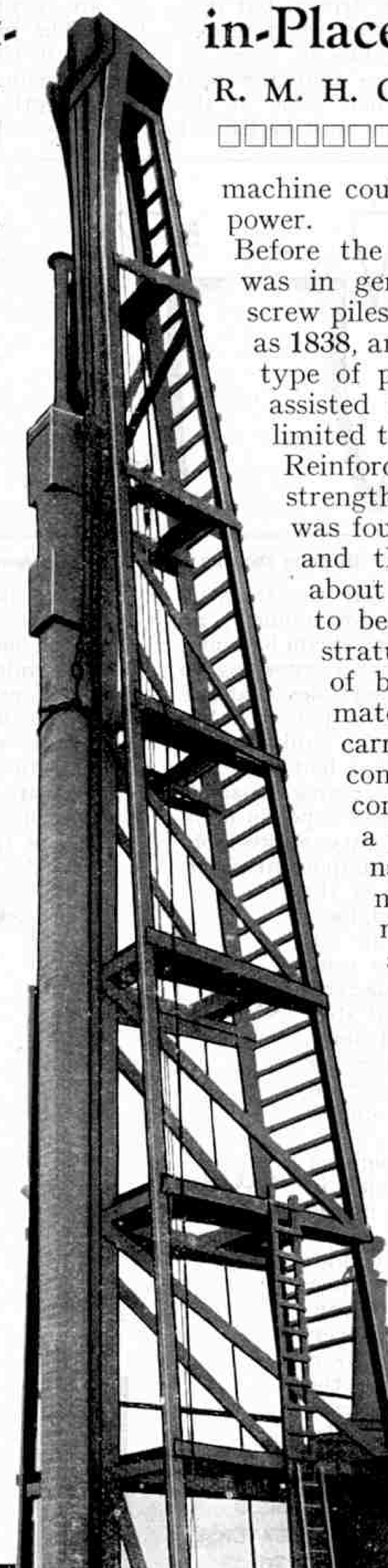
The Use of Cast-in-Place Concrete Piles

By R. M. H. Garvie, B.Sc.

THE pile is by no means a new invention, although its widespread use and the scientific methods prevailing would incline one to think so. On the contrary, pile-driving seems to be as old as Man himself. The desire for security from wild animals led primitive Man to build his house on wooden stilts over the water of a lake or river, and structures of a similar type are still to be seen in Celebes and other parts of the East Indies. Remains of this type of dwelling found in the Swiss lakes are believed to belong to the Neolithic or New Stone Age, and this indicates that piles were used as far back as 10,000 years ago.

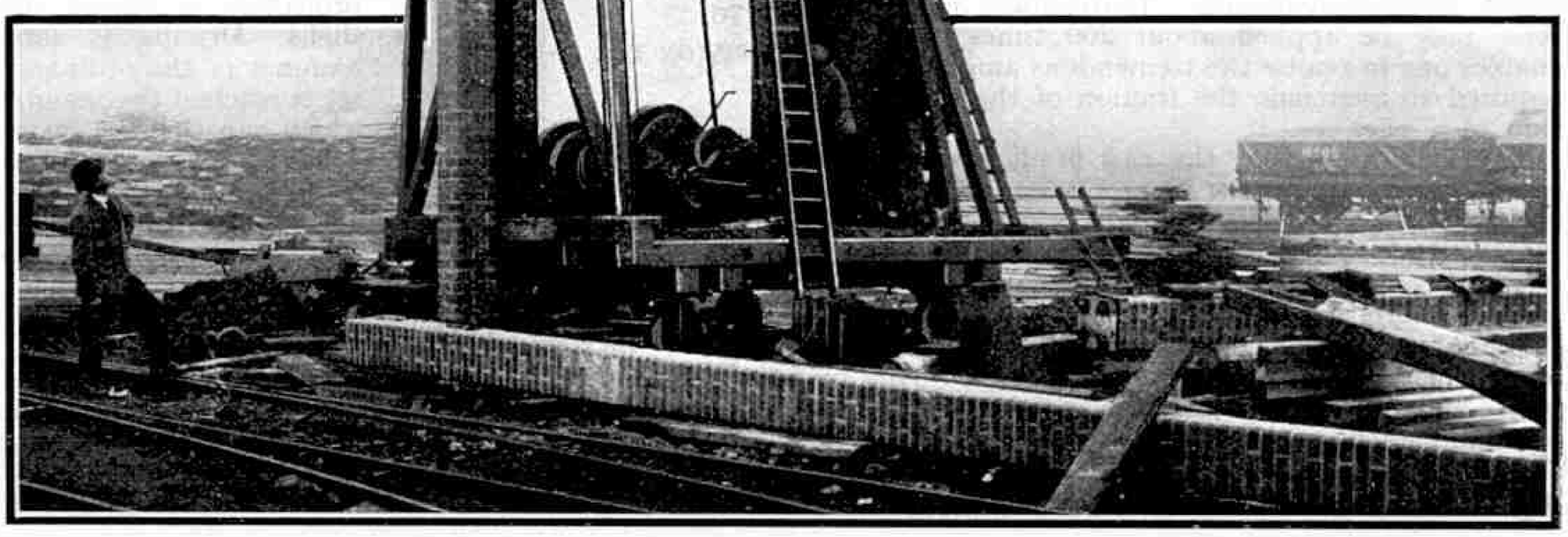
The Romans made considerable use of piles in foundation work. The earliest Tyne Bridge, as was stated in the *"M.M."* for March last, was built by the Romans about A.D.120, and its piers rested on piles. In 1176 Old London Bridge was commenced, and in 1761, during repair work, it was discovered that most of the timber piles upon which it was founded were still in good condition after 585 years under water. Little progress seems to have been made between the time of the Romans and the 19th century, and it is only during the past 50 years that anything in the nature of rapid development has taken place.

Before the introduction of various types of steam hammers piles were driven by "ringing engines" and "monkey engines." In the former, a ram weighing about 800 lb., and moving between timber guides, was attached to one end of a rope that passed over a pulley at the head of the frame. The other end of the rope branched out into a number of smaller ropes, each held by a man, in the proportion of 40 lb. to each. The ram was lifted 3 ft. or 4 ft., and at a given signal the men all released their ropes together. Allowing the crew frequent rests, as many as 4,000 or 5,000 blows per day could be given. The monkey engine was a slight advance on this awkward machine, being more economical in labour. A lighter ram, held by a pair of tongs, was raised 10 ft. or 15 ft. by a windlass, and at the top of the lift the tongs were forced open by two inclined planes, and the ram was released. This machine could be operated by men, horses or steam power.



Before the advent of reinforced concrete, timber was in general use for piles, although cast iron screw piles had been employed successfully as early as 1838, and cast iron disc piles in 1858. The latter type of pile was sunk by light blows of a ram, assisted by a water jet at the point, and was limited to use in sand, silt or other soft material.

Reinforced concrete, by reason of its great strength, durability and ease of manipulation, was found to be an excellent material for piles, and the pre-cast pile made its appearance about 30 years ago. When pre-cast piles are to be driven, the depth of a sound bearing-stratum must be ascertained by the sinking of boreholes or trial-pits. In fairly stiff material, however, quite heavy loads can be carried by the friction on the surface of the concrete, which is proved by the fact that considerable force is required to withdraw a pile only a few days after driving. The nature of the subsoils having been determined, the piles are cast in moulds of the necessary length, and left to "ripen" for a period ranging from four to six weeks, depending on the size of the pile, the nature of the concrete, and the weather. The use of special cements reduces this time considerably, and a pile in which aluminous cement has been used can be driven within a very few days. The length of pre-cast piles is limited more by local conditions than by the qualities or faults of the material. For pier work at Manila, for instance, the concrete piles used were 24 in. square, and the length in some cases was as much as 110 ft. Piles of those dimensions would weigh about 29 tons, and they were driven by a 4,000 lb. steam hammer, assisted by water jetting.



A reinforced brick pile 40 ft. long and 14 in. square being driven with a 50-cwt. semi-automatic steam hammer. This was probably the only occasion on which reinforced brick piles were successfully driven.

Lengths up to 60 ft. are common, and the usual section is about 16 in. square, hexagonal, or octagonal.

The disadvantages of pre-cast piles are more obvious than the advantages. Valuable storage space is required for the moulds, and the finished piles, especially the longer ones, must be very carefully handled. One can examine the steel reinforcement in the mould and see the finished pile before it is driven, but it is impossible to say whether it is still sound after the repeated shocks of driving. If the bearing-stratum varies in level, or contains crumbled areas, it frequently happens that the trial boreholes do not reveal the whole truth. Then some of the piles will be too long and the protruding portions must be hacked away, a proceeding that is very wasteful of both labour and material. Similarly some of the piles will be too short and extra lengths must be added, resulting in an unsatisfactory job as regards strength. The pre-cast pile is now to a great extent displaced by cast-in-place varieties which, while possessing minor faults of their own, have not the serious disadvantages of the older type. Cast-in-place concrete piles will be described in detail later in this article.

Modern systems of pile-driving depend in the majority of cases upon steam for their power. This is almost invariably so with impact drivers, and is true also of most of the special varieties of cast-in-place piling methods. Where the steam is used to operate a winch that raises the ram or monkey, no explanation is needed. The ordinary double-acting steam hammer, which delivers from 100 to 300 blows per minute according to its size, has not been very successful for driving piles that are to carry heavy loads. It has been found that a pile that has been driven by a steam hammer can usually be sunk a little farther after some time has elapsed. Hence, if it had been left at its original depth, it would have had a lower bearing capacity. Again, the force of the blow of a steam hammer depends upon steam pressure, and therefore this force may vary appreciably during the driving of a long pile. This is a very important point, for it is by a knowledge of the distance moved by the pile per blow of the hammer that the engineer determines the bearing power. This fact is an additional reason for the use of the gravity-drop ram.

The steam hammer is by no means useless, however, for it is employed extensively for the driving of steel sheet piling. This type of piling consists of long, narrow, interlocking sheets of steel, and it is used for enclosing excavations, for holding back water or unstable material from workings, and for other similar purposes.

In the semi-automatic steam hammer the engineer has a ram that drops under gravity and is quick in action, 50 blows per minute being an average figure. Instead of the piston delivering the blow, as is the case with the double-acting hammer, it is the cylinder that moves. The whole apparatus rests on a timber "dolly" or cushion on the head of the pile to be driven. A workman pulls a rope attached to the valve lever, and steam is admitted to the space above the fixed piston through the hollow piston rod, forcing the cylinder to rise. At any desired height the valve lever is released, and the steam exhausts while the cylinder drops on to the pile. This operation can be carried out from 40 to 60 times per minute, the principal governing factor being the length of the stroke. A two-ton hammer falling 4 ft. strikes with a force of nearly 18,000 foot-pounds. In driving a 30-ft. pile this force may be applied about 200 times, a fact that enables one to realise the tremendous amount of energy required to overcome the friction of the strata on the skin of a pile.

The introduction of the cast-in-place concrete pile sprang from necessity. The pre-cast pile had to be left for about six weeks after it was made before it was sufficiently "ripe" to drive, and during that time the moulds were occupying space that might have been utilised more profitably in some other manner. If the moulds were not close to the site of the work, the piles, when ready, had to be transported to the piling frame and hoisted into position, a job requiring great care and precision. Finally there was always the possibility of a crack developing in the pile during placing or driving. It was natural, therefore, that engineers should concentrate on the evolution of a pile that could be cast in its final position, and to the exact length required. In addition the method would have to provide some means of calculating the safe load that could be carried by the stratum under the point of the pile, or by the friction on the intermediate strata, or by both. These difficulties have been very largely overcome, and to-day there are available several successful cast-in-place piling systems.

The main point of difference between these various systems lies in the manner in which the hole in the ground is made. It is obvious that a hole from 12 in. to 20 in. in diameter and 30 ft. in depth cannot be dug out with a spade, but it seems as if almost every other implement can be employed. Tubes can be driven or screwed into the ground, and holes can be bored out or formed with water jets, perforators, and even explosives.

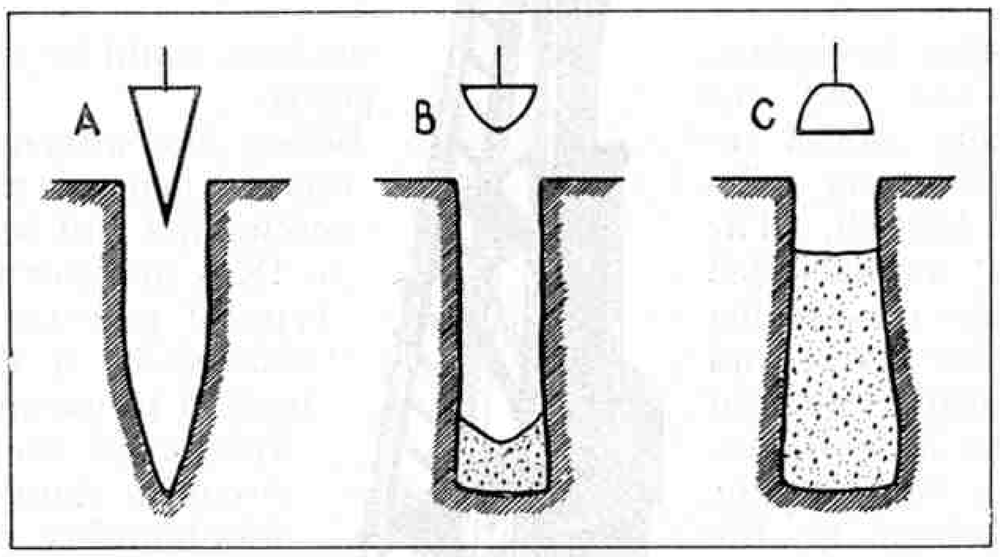


Fig. 1. Diagram showing one method of digging holes for piles.

Fig. 1 shows how the perforator is used in one system. A hole is punched out with the punch A, which weighs a little more than two tons. The bottom third of the hole is then filled with concrete, and the tamper B, two tons, is used to increase the diameter of the base. Finally more concrete is poured in, and rammed with C, two tons, the pile then being about 30 in. in diameter. This method is not entirely successful in soft soils, however, as the punch A is difficult to withdraw; nor in incompressible soils, where B makes no impression. In another system a tube is driven to the required "set" or depth, and a small charge is exploded at the bottom. This forms a bulb-ended pile, which has a fairly high bearing capacity. The use of explosives makes skilled supervision a constant necessity in this method, however, and in any case explosives are not popular where their use can be avoided.

Of the many systems for the formation of cast-in-place piles there are a few that can be considered as representative or typical, and an examination of two or three of these will give a good idea of the whole range.

In the Raymond piling system a tapered steel tube is driven into the ground and filled with concrete. This tube is of thin steel, and for driving it is fitted over a heavy steel mandrel or core in telescopic sections. The core is split vertically down the centre, so that while driving is in progress the two halves are forced against the sides of the shell. When the requisite set has been obtained, the first upward jerk on the core causes the two portions to collapse inward, and it is then easily withdrawn by means of a winch. Finally the shell is filled with concrete, reinforced if necessary with steel bars. The core is 8 in. in diameter at the bottom, and the diameter increases at the rate of .4 in. per foot. The present limit of length for a standard Raymond pile is about 40 ft., and the diameter of a pile of this length would therefore increase from 8 in. to 24 in. Where greater lengths are required the Raymond system employs a composite pile. A timber pile is driven first, and when it is almost flush with the ground the standard telescopic steel shell and mandrel are placed on top and driving goes on as before, the upper length eventually being filled with concrete.

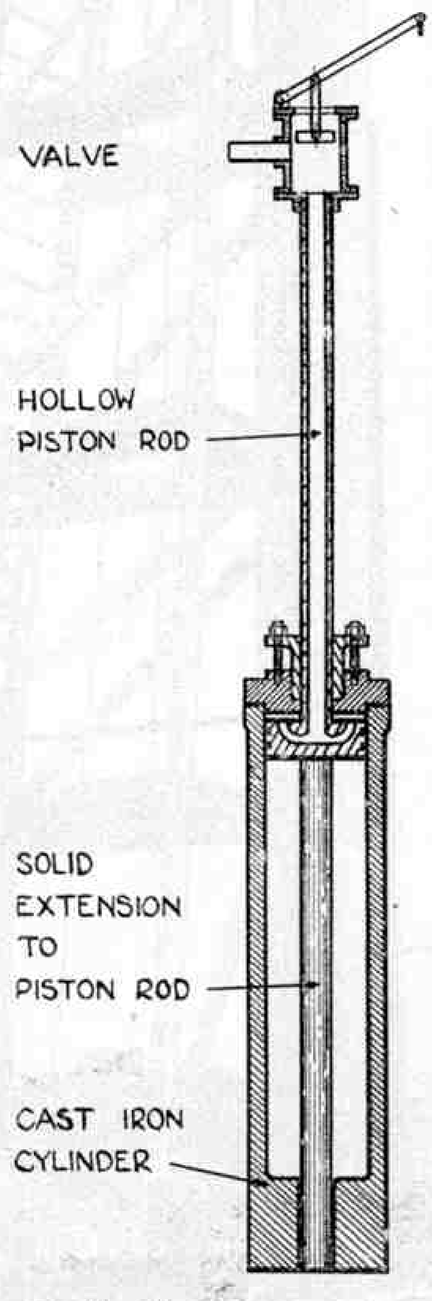


Fig. 2. The general arrangement of a semi-automatic steam hammer.

West's Rotinoff process is similar to the Raymond process in regard to employing a tube driven on a mandrel. In the Rotinoff system, however, the tube is made up of pre-cast reinforced concrete shells, 14 in. or 18 in. in diameter, and about 3 ft. long. For driving, these are fitted over a steel mandrel that has a helical projection or thread corresponding to grooves in the shells. Driving is carried out with some type of hammer in the ordinary way, and when a satisfactory set is reached the mandrel is unscrewed from the shells, which can then be inspected before filling by lowering a light. While the shell is being filled with concrete to form the cast-in-place core, the frame is free to move to the next position and drive another tube. The 18 in. diameter pile can safely carry a load of 80 tons, provided that the strata through which it passes and on which it rests have a sufficiently high bearing capacity.

In the Vibro process of the British Steel Piling Company the tube, which is driven to a set with a semi-automatic steam hammer, does not remain in the ground, and the manner in which it is withdrawn is one of the features of the system. The tube is of $\frac{3}{4}$ in. steel, and has an out side

diameter of 16 in. The cast iron shoe that leads the tube has an outside diameter of 17½ in., which therefore is the final diameter of the hole. When the tube has been driven, reinforcing bars are lowered into position and held by a rope, and concrete is poured into the tube through a spout at the top. Long links are then brought up and passed over projections on each side of the head of the tube and of the hammer; these links are attached by ropes to a winch on the piling frame, and a constant pull is maintained during extraction. The stroke of the hammer is reduced by the links to about 12 in., and the force exerted on the tube is alternately upward and downward. The up-stroke lifts the tube about 1½ in., and the down-stroke sinks it about half that distance. Thus as the tube rises the concrete flows outward to take its place, and the down-stroke has a tamping or consolidating effect.

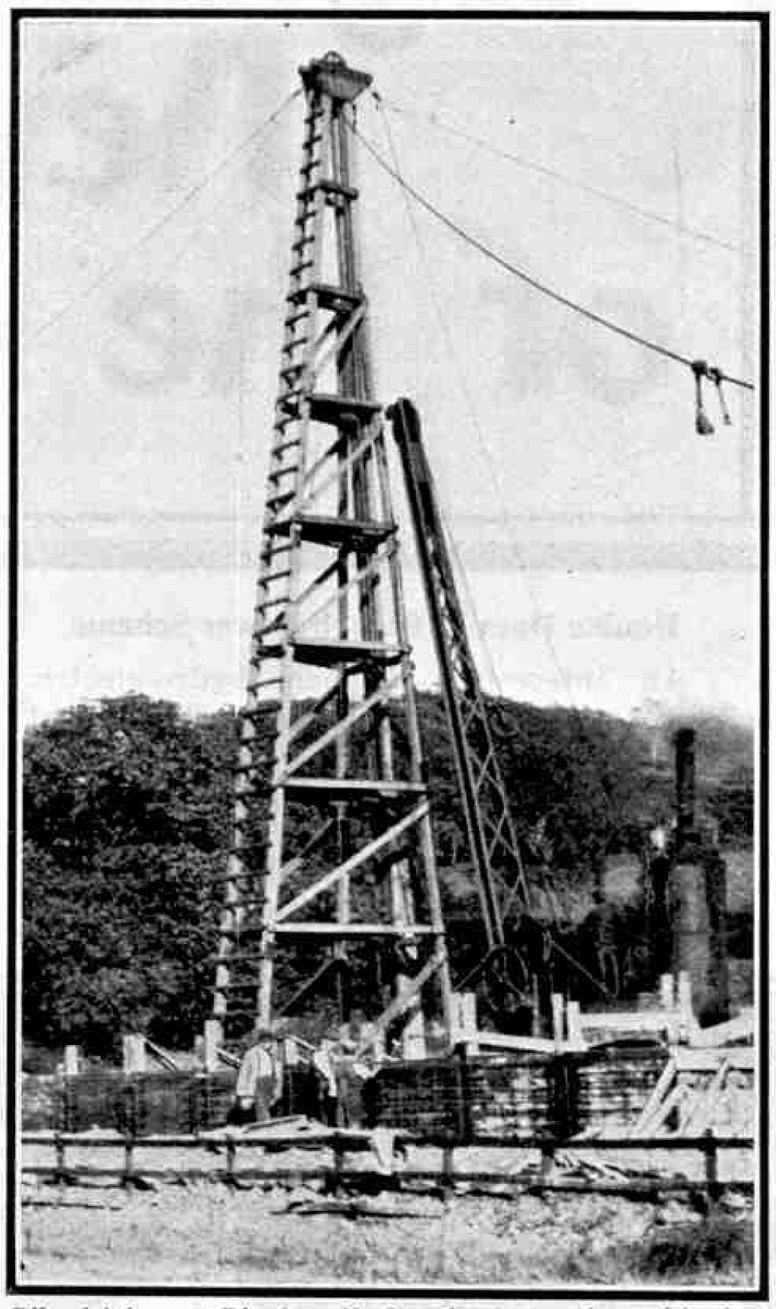
This operation, which is quite automatic, takes place from 70 to 80 times per minute, and when finished piles have been laid bare they have been found to have corrugated sides, a condition that must increase their frictional resistance. Piles up to 97 ft. in length have been made with this system, and probably this figure will be exceeded before long. The safe load of a Vibro reinforced concrete pile is about 60 tons, with the usual condition that the sub-strata should have the necessary bearing capacity.

In the Raymond, Rotinoff and Vibro systems we have in each case a tube that is driven to a previously-determined set, just in the same manner as a pre-cast pile is driven. With certain slight modifications, which are mainly governed by the type of plant used, the same formulæ could be applied in each case. The system adopted by the Pressure Piling Company is fundamentally different from those already described, in that driving, in the literal sense of the word, is not a part of the process. A hole is formed by sinking heavy pipes into the ground under their own weight, the disturbed material being removed from the interior by methods similar to those employed when trial boreholes or wells are sunk. In this way a knowledge of the underlying strata is obtained, and in fact a trial borehole is sunk for every pile.

When at length a bearing stratum is reached, the boring is continued for 2 ft. or 3 ft. so that the pile will key into it. Any necessary reinforcement is then lowered into position and held. A special cap is screwed on to the uppermost tube, and compressed air drives out any accumulation of water through a pipe that reaches to the bottom of the hole. The short length at the extremity of the hole is filled with cement, which is forced in at a pressure of seven atmospheres. Then concrete is poured in, and compressed air squeezes it into all the weak spots, while at the same time the tube is raised slowly by the pressure on the underside of the cap. The extraction process is sometimes assisted by the use of a light winch, or jacks. The final pile has a base that is larger than the average section, and its sides are irregular where the concrete fills up the weaker portions of the surrounding material. Consequently the bearing capacity of the pile is assisted considerably by the friction on the surface.

The most important feature of the Pressure system is that the operation can be carried out with only 6 ft. headroom. It is obvious, therefore, that this type of pile is very suitable for use where existing structures restrict the available space. For instance, insecure buildings can be strengthened by the sinking of piles through the cellar floors, or by having the piles very close to the exterior walls and buttresses. As there is no vibration, there is no danger even to the most decrepit building.

The subject of pile driving cannot be left without some mention of "dollies" and "shoes." The dolly is a cushion that preserves the head of a pile or tube from injury during driving. It is usually made of timber, rock elm being a popular variety; and often a steel plate is spiked to its upper face. A small proportion of the energy of the hammer is absorbed by the dolly, but this is allowed for in the calculations. Another form, for use on pre-cast concrete piles, consists of an inverted cup filled with sand. This rests on the head of the pile, and the sand deadens the blow and prevents the concrete from being sheared off at the sides.



Pile driving at Bingley, Yorks., in connection with the construction of a series of concrete "cradles" to support a water pipeline.

Shoes are used for the double purpose of protecting the point and forming a cutting edge. For timber piles they usually take the form of a cast iron point with steel straps that are spiked to the sides of the pile (1, Fig. 3). For pre-cast concrete piles the shoe is similar, except that the straps turn inward and are embedded in the concrete (2, Fig. 3). Two types of shoe used in cast-in-place piling systems are also shown in the figure. No. 3, which is of cast iron, remains at the bottom of the hole after driving, whereas No. 4 is withdrawn. The latter shoe is in the form of a pair of jaws, hinged to the bottom of the tube. The first upward pull causes them to open, and extraction is then simple. This shoe is known as the "alligator point," and is used in the Simplex piling system, which falls into the "tube driven, filled and withdrawn" category.

A different type of shoe is used in driving timber sheet piling. This shoe is of cast iron, and instead of being pointed it has a blade that slopes from one side of the pile to the other at an angle of about 25 degrees to the horizontal. The pile is placed ready for driving so that the lower end of the blade is against the pile last driven. In driving, the tendency is for the pile to be forced up to its neighbour, and a tight joint is thus obtained. This is very important in works where running sands, water, or water-logged subsoils are likely to be encountered, but the use of this pile shoe minimises the difficulties of accurate driving and results in a very satisfactory sheeting.

In a majority of cases piles are used to transfer the weight of some structure down to a sound bearing-stratum, such as rock, or by surface friction into some reasonably sound intermediate strata. They are then acting as columns, and differ only from the ordinary type of column in that they are embedded in the earth.

Many old buildings of historic interest have been saved from ruin by having their unstable walls or sinking foundations assisted by piles. Piles can be driven at a slight angle on either side of a buttress and connected so as to take the load off the older structure. An old and faulty foundation block can be encircled with piles and temporarily supported while an excavation is made beneath it. A concrete slab is then formed across the pile-heads and the block rests on a firm base once more. These are cases where the Pressure Piling System is seen to great advantage, for reasons already mentioned.

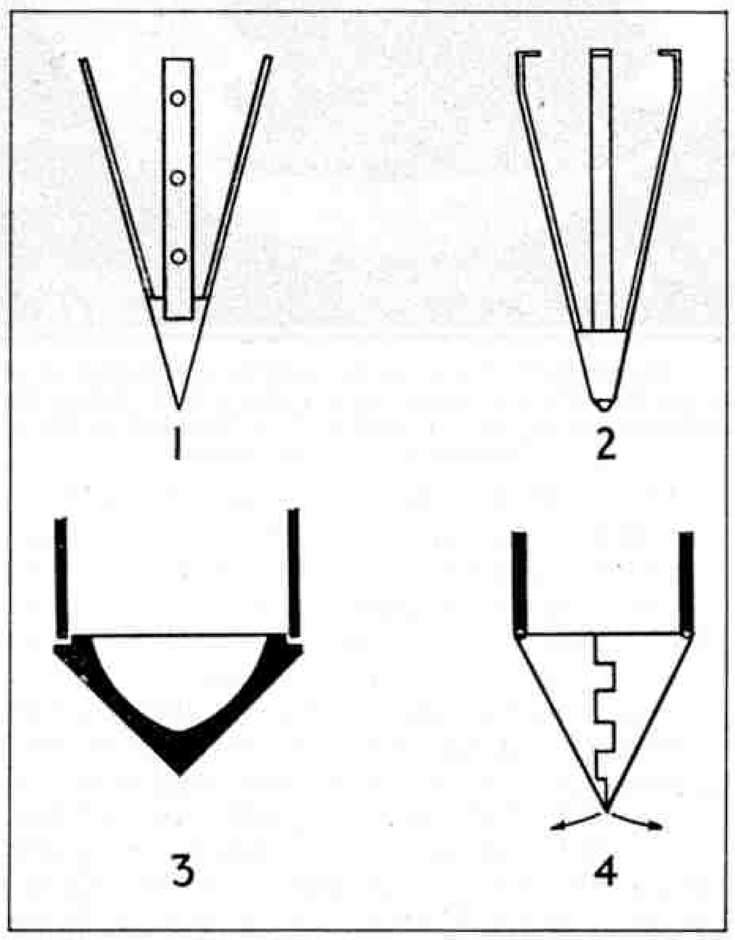


Fig. 3. Types of "shoes" used in pile driving.

The vertical members of wharves and jetties are usually piles of which the upper lengths protrude above ground level. Bridge piers in waterways or swift-moving streams are often protected by having piles driven round them to act as a fender. Considerable damage may be done by the scouring action of currents, or by the impact of a ship, a barge, or heavy floating wreckage; and if this possibility can be avoided the piles are certainly worth the additional expenditure.

Consolidation piles are usually about 6 ft. to 12 ft. in length, and their purpose is to compress the upper soils into a compact mass. A definite load is not assigned to each pile, but the total is distributed over the whole of the piled area at so many tons per square foot. These short piles are of use when the load to be carried is too great to be placed directly upon the surface, but not great enough to justify the driving of longer piles down to rock. Timber and pre-cast concrete are the most suitable materials for making consolidation piles, bulk being quite as important as strength.

Engineering News of the month.

Testing Metals under Loads of 1,785 Tons

A testing machine that is believed to be the largest of its kind in the world has been constructed by the Baldwin-Southwark Corporation of Eddystone, Philadelphia, for use in the engineering laboratory of the University of California. The machine is capable of applying compression loads up to 1,785 tons to columns of steel and other metals of lengths up to 33 ft. 6 in. and may be used also for measuring their resistance to pulls of 1,340 tons.

The overall height of the machine is 71 ft. 9 in., 26 ft. being below floor level, and its weight is 212 tons. It is accommodated on a large cast steel table 17 ft. 3 in. in length, 6 ft. 6 in. in width and 2 ft. 11 in. in depth, that weighs nearly 22 tons. The table supports two cast steel columns 10 ft. apart, and specimens are carried between the columns on a truck, from which they may be lifted by the machine itself and then placed in position for testing.

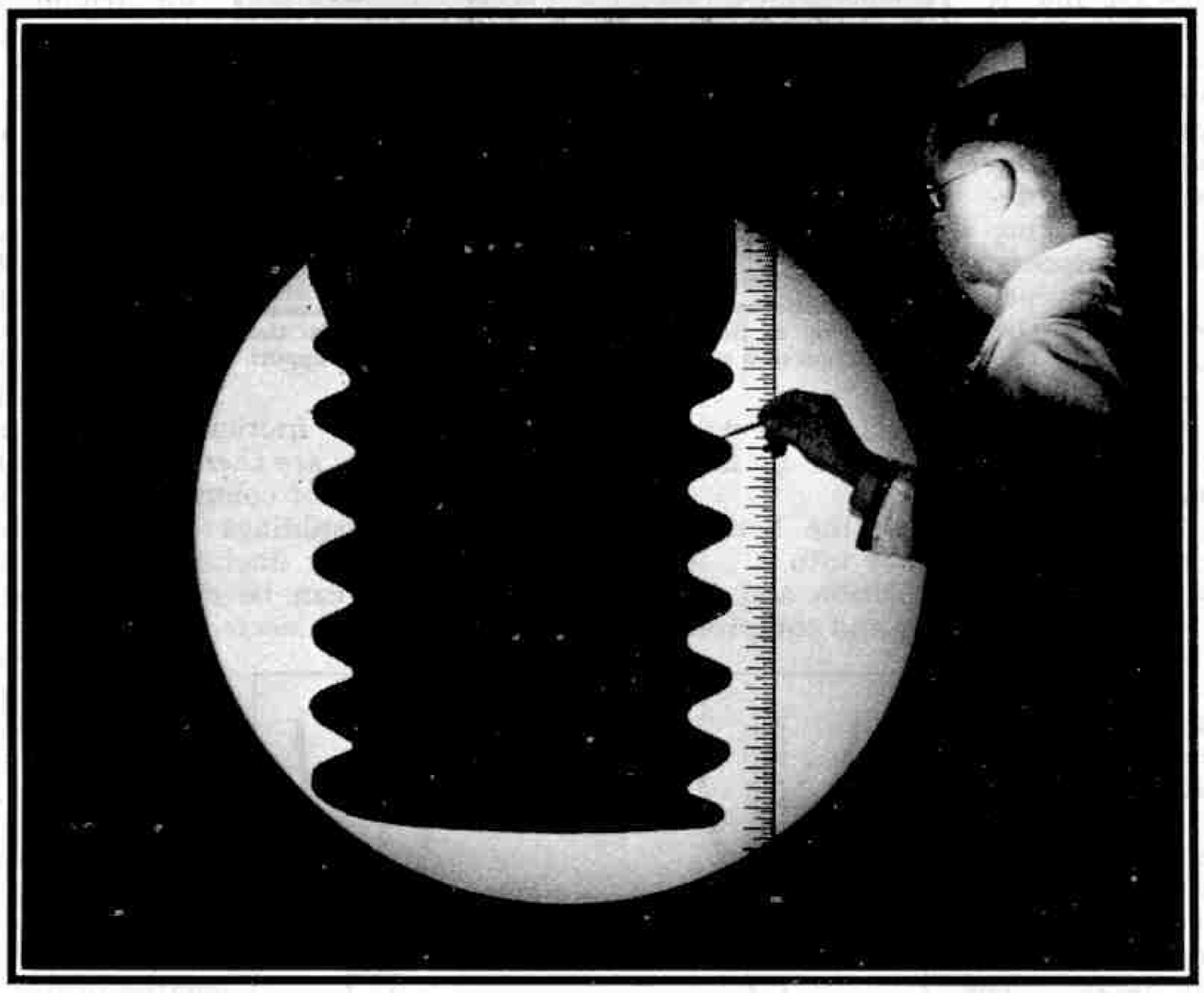
Columns of metal to be stretched during trials, are fitted between two crossheads, each of the nickel-chrome steel grips provided for this purpose weighing 1½ tons. Columns to be compressed are placed between the lower crosshead and the supporting table. In each case the lower crosshead is moved downward in order to apply the force to be measured, and the operation is hydraulic, a multiple rotating cylinder pump driven by a 20 h.p. motor applying any pressure required up to a maximum of 2,500 lb. per sq. in. The force exerted is measured by means of sensitive gauges, and the behaviour of the trial piece is carefully watched during each test.

The machine is controlled from a room built at a distance. Loud speakers are provided in order that the progress of tests may be announced and a lift is installed to enable students to examine every portion of a specimen under test, this being necessary owing to the great height of the machine and of the columns that are tested in it.

Double Dam in French Power Scheme

An interesting French hydro-electric power scheme now being carried out involves the erection of two dams in the course of the River Drac at Sautet, about 45 miles from Grenoble, where it flows through a deep and narrow ravine. The ends of the upper dam, which will be 295 ft. in height, will be anchored in recesses cut out of rock, and its construction will result in the formation of a lake or reservoir about 875 acres in area and containing about 170,000,000 cu. yds. of water.

The second dam is to be built lower down the gorge for the purpose of impounding water from the spillway of the first barrage. It will be 130 ft. in height, giving a total height of water available for power purposes of 425 ft. It is expected that the power stations to be built will produce 185,000,000 kw.h. annually and the work of constructing the dams should present a number of interesting engineering problems, for the river is very turbulent at the point selected.



Testing a terminal screw for use in making a tumbler switch, as described on page 100 of the "M.M." for February. Projecting the greatly enlarged shadow on a screen enables the pitch to be accurately measured. For this photograph we are indebted to J. A. Crabtree & Co. Ltd., Walsall, in whose laboratories it was taken.

British Drivers' Motor Car Speed Records

On 8th February last Mr. George E. T. Eyston, the famous British racing motorist, set up a world's light motor car record of 118.38 m.p.h. This speed was reached in runs over a measured mile on Pendine Sands in a 746 c.c. M.G. Midget. Mr. Eyston created a second record by covering the kilometre at an average speed of 118.36 m.p.h. It is of interest to note that the car in which these records were made was designed after a series of experiments with a scale model in a wind tunnel.

Three weeks after creating these records Mr. Eyston assisted Kaye Don, E. A. D. Eldridge and A. Denby to set up eight records at the French racing track at Montlhéry, near Paris. The four drivers used a Delage machine and relieved each other at intervals of three hours. Six of these were world records, and the remaining two were international records, the difference being that a world record is for any type of car or motor cycle, while international records are only for a particular size of motor car or motor cycle.

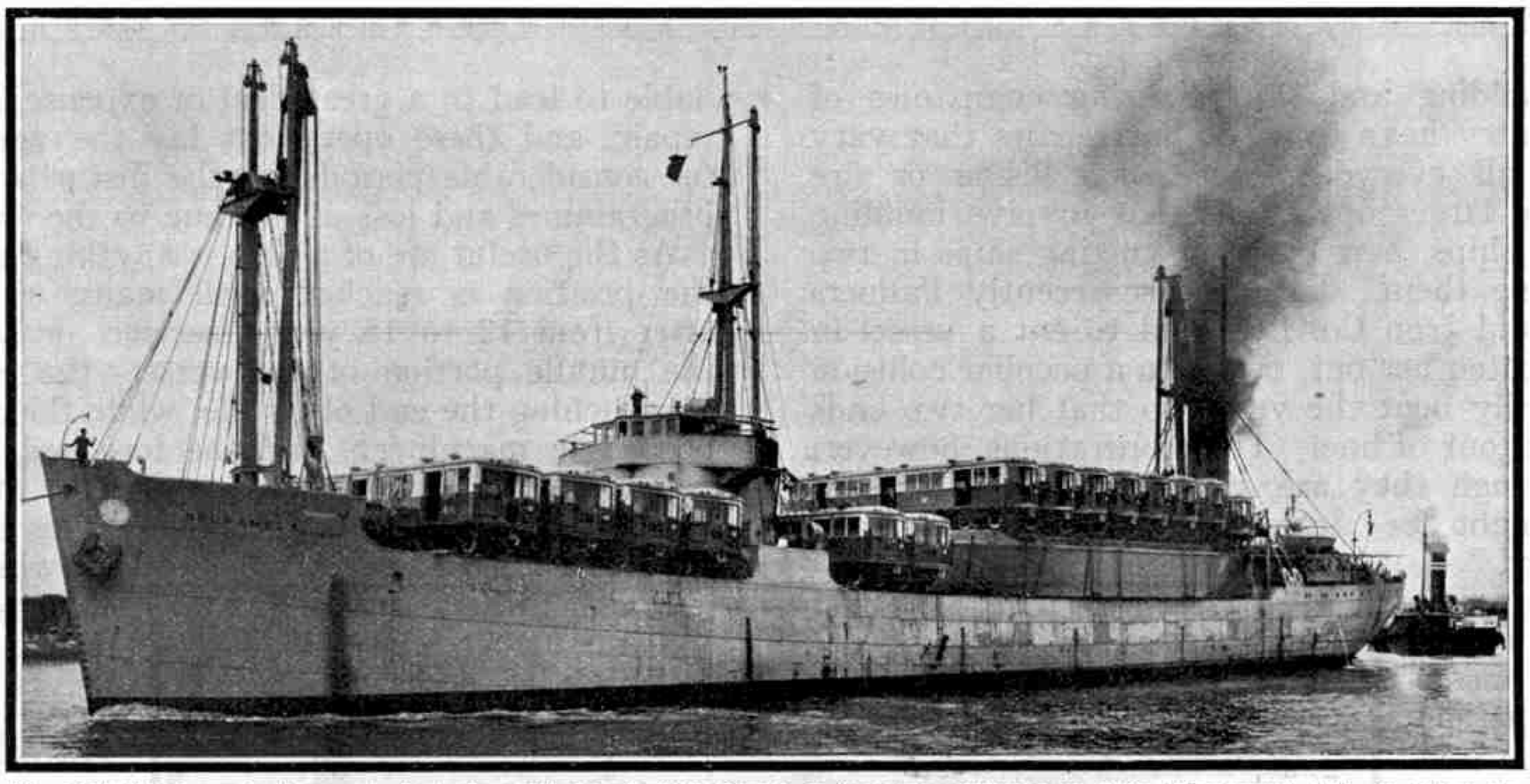
The world records were for 500 km., this distance being covered in 2 hrs. 38 min. 14.82 secs. at an average speed of 189.577 k.p.h. (117.437 m.p.h.); the three-hour record, gained with a distance of 568.891 km. (353.383 m.) at an average speed of 188 k.p.h. (116.816 m.p.h.); the 1,000 kilometres record, the time for this being 5 hr. 18 min. 37.5 sec.; the six-hour record, with a distance of 1,130.902 km. (702.695 miles); and the 1,000 miles and 2,000 kilometres with times of 8 hrs. 35 min. 38.2 secs. and 10 hrs. 42 min. 20.54 secs. respectively. The international records were for 200 miles, covered in one hour 42 min. 9.13 secs., and 500 miles, the time in which this distance was covered being 4 hrs. 16 min. 59.54 secs. The four British drivers were specially chosen by the Delage Company to make the attempt on the record, and they flew to France on the previous day.

Tunnelling Under Straits of Gibraltar

An illustrated article on page 378 of the "*M.M.*" for May, 1930, dealt with a proposal to link Spain with Africa by means of a railway tunnel under the Straits of Gibraltar. The scheme aroused great interest, and a Spanish Government Commission carried out the necessary preliminary work of boring near the proposed tunnel entrances in order to find what kind of rock would be encountered, while the depths of the Straits on the line of the tunnel were measured by soundings made from a Spanish gunboat.

Two different routes for the tunnel have been suggested since the one described in the "*M.M.*" was outlined. The most recent proposal has been put forward by a Viennese civil engineer, and it provides for the construction of a tunnel 23.4 miles in length between the two countries. This would not be straight, but would consist of two sections nearly at right angles to each other and joined halfway between Europe and Africa by a short curved section. The route suggested would avoid the deeper portions of the straits, and the greatest depth to which the tunnel would have to be carried would be only 1,180.8 ft. below sea level. The European entrance would be five miles west of Tarifa, and on the African side the tunnel would emerge almost exactly opposite that city. A tunnel at Gibraltar itself would be impossible, for there the Straits are 3,280 ft. in depth.

The proposed tunnel would consist of two parallel bores, 131 ft. apart. Each of these would have a diameter of about 23 ft., and they would be connected at intervals by crosscuts. A branch tunnel sloping downward from the lowest point of the main bore would lead to the bottom of a deep shaft on the European side, the purpose of this branch being to drain the railway tunnels; and water collecting in the sump at the bottom of the main shaft would be pumped to the surface as required. The author of the scheme claims that it would be cheaper to carry out than previous plans, and the easier gradients provided would greatly reduce operating costs. In spite of the great length of the tunnel the designer does not anticipate difficulties with ventilation, for electric locomotives only would be used in hauling trains through it. No trouble is expected in regard to the temperature of the air in the tunnel, for it is thought that this could be maintained below 30°F. without difficulty.

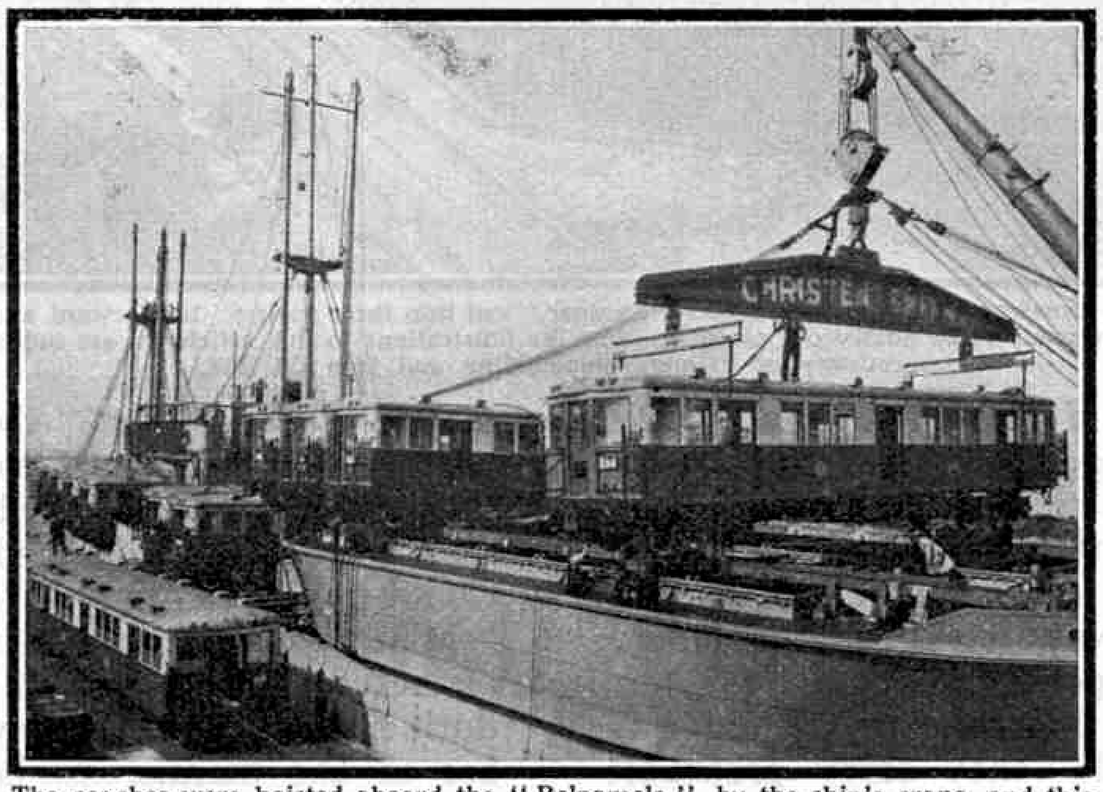


The M.V. "Belpamela," one of a fleet of special ships built by Sir W. G. Armstrong Whitworth & Co. (Engineers) Ltd., to whom we are indebted for this photograph and the one below. The ship is seen bound for Buenos Aires with a cargo of 22 electric railway coaches and two large steel barges.

Giant Transformer for New York Power Station

A transformer built by the Westinghouse Electric Company for service in the Hell Gate Power Station, New York, is claimed to be the largest self-cooled two-winding rating ever built. Its capacity is only 70,000 kv.a. but it weighs 220 tons, is 28 ft. in height, and occupies 750 ft. of floor space. In bulk, the transformer rivals those described in the article on page 754 of the "*M.M.*" for October, 1930, but it is inferior in weight and capacity. Ten railway wagons were required to carry it from the Westinghouse Works to New York, five of these being necessary for the carriage of the oil required for insulating and cooling purposes.

The carriage by rail of transformers of this size formerly involved the selection of a route that avoided tunnels or bridges with insufficient clearance, and even then special precautions often were necessary. For instance, at one point of the journey to their destination of the transformers described in the article already mentioned, a section of track had to be lowered several feet. No difficulty of this kind was encountered with the transformer for the Hell Gate Power Station owing to the improved design followed in construction.



The coaches were hoisted aboard the "Belpamela" by the ship's crane, and this photograph shows one of the coaches being skidded into position on a platform built up in the barges.

Giant Dredger for Tin Mine in Malaya

A dredger designed for use in an alluvial tin mine in Malaya will be worked at greater depths than any machine of similar type yet built. Its hull is 276 ft. in length, 65 ft. in width, and 12 ft. in depth. The dredging equipment consists of a chain of 132 buckets, each of which has a capacity of 12 cu. ft., and these are carried on a ladder 195 ft. in length that is capable of working to a depth of 130 ft. below the water line. In the district where the dredger is to operate the tin-bearing ground is covered with an overburden, or covering layer of soil, 60 ft. in depth.

Dredging is an interesting means of extracting alluvial tin from the ground in which it occurs. The hull of the dredger usually is towed into a pit dug over the area to be worked to a sufficient depth to enable it to float in the water that is admitted. The superstructure is then erected, and the dredger set to work to bring up the tin-bearing earth from the bottom of the pond, more water being admitted as the hole is enlarged. The material brought up is delivered into a hopper, and taken to a plant in which earth is washed out by shaking it with water, leaving behind the heavier tin ore, which is further concentrated and smelted.

World's Fastest Motor Vessel

A twin-screw motor ship that is designed to have a speed of 23½ knots, and thus to be the fastest motor ship in the world, is now being constructed by the Société Anonyme John Cockerill of Hoboken, Belgium. She is intended for the service between Dover and Ostend, and it is expected that she will be brought into use in about two years. Sulzer engines are to be installed, and it is understood that they will develop a maximum of about 17,000 h.p.

Pumping Water to Height of 3,075 ft.

Water from springs near the bottom of the Grand Canyon of the Colorado is to be raised by means of electrically-driven pumps through a height of 3,075 ft. for the use of tourists staying at a holiday resort. Pipes 5 in. in diameter will be used, and nearly two miles of these will be fixed on the wall of the gorge, which is almost perpendicular. The work appears to be dangerous, but is to be completed in four months. The water at present used at this holiday resort is brought 100 miles in special tank cars, a very unsatisfactory method.

Surgical Operations to Ships

Oil Tankers Given a New Lease of Life

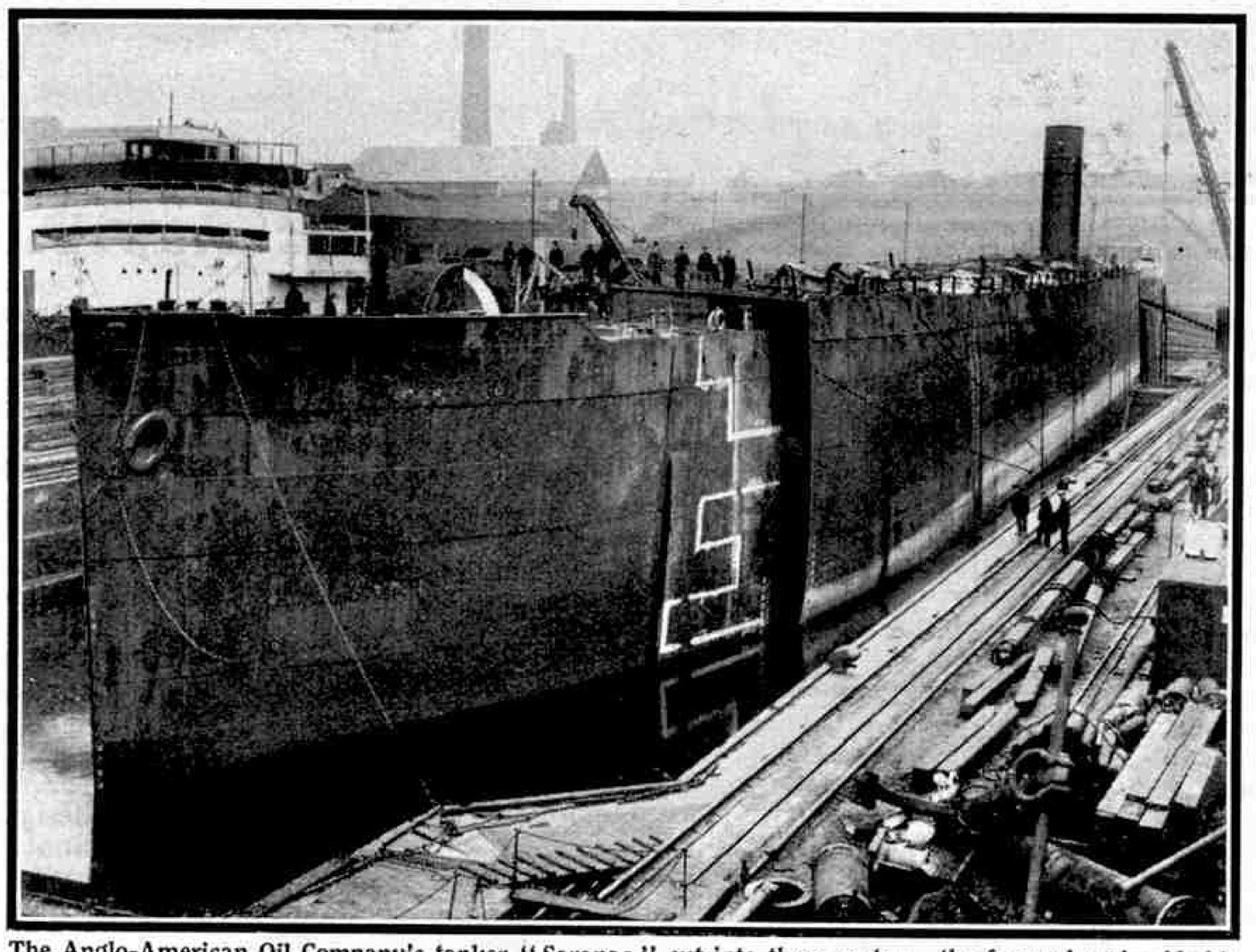
THE shipbuilding and ship-repairing companies of this country have to carry out repairs that vary from small everyday cases of collision or fire damage, up to larger operations that involve building new halves of ships, new bows, or cutting ships in two and lengthening them. In one case recently Palmers Shipbuilding and Iron Co. Ltd. had to cut a vessel in two and straighten her out, owing to a peculiar collision that had literally bent the vessel so that her two ends were some 2 ft. out of line. These operations, however, interesting though they are, come under the class of work that might be described as constituting the "accident ward" of everyday shipping life. In this article we describe an operation of a different nature, also carried out by the Palmers Company, the effect of which was to give a new lease of life to two oil tankers.

For many years oil has been carried in specially-designed tank vessels, in which the structure of the ship itself forms the containing tanks holding the liquid; that is to say the oil or spirit is not carried in separately built tanks contained within the ship. A large vessel may have as many as 40 such tanks, for there may be different grades of oil carried. In any case the tanks cannot be very large, because a ship is not steady, and it is necessary to confine the liquid within small limits, otherwise the battering-ram action caused by the ship's movement at sea would cause serious damage to the structure. Nowadays the machinery is always fitted aft in this type of vessel.

Tank vessels are peculiar in that they are the one-way traffic of the shipping world; they carry profitable cargo one way, but none on the return trip. They do not go back empty, however, for several of the tanks have to be filled with salt water in order to give the ship sufficient immersion for her return voyage. Then again the tanks must be steamed out and cleaned down between voyages.

These conditions of service are unfortunately ideal for the formation of scale and other effects of corrosion, resulting in a gradual wearing away of the ship's structure in the region of the oil tanks. Thus after some 12 years' service the condition of the steelwork in that region is liable to lead to a great deal of expense in renewal and repair, and these operations lay the vessel off service for considerable periods, to the disturbance of running programmes and loss of revenue to the owners.

As the useful life of a ship is anything up to 24 years, the position is reached with many oil tankers that after from 12 to 15 years' service, or sometimes less, the middle portion of the vessel—the oil tankage—is approaching the end of its life, while the aft end and its propelling machinery, and the fore end, together with valuable pumping machinery and other fittings, are still good for another 12 years or so. This is the position in which the Anglo-American Oil Co. Ltd. found themselves with two of their 17,000-ton tank steamers. These vessels are 544 ft. long, 66 ft. broad and of about 24,000 tons displacement. They are nearly as long as the frontage of Buckingham Palace, and that means a very large vessel.



The Anglo-American Oil Company's tanker "Saranac," cut into three parts; the forward and mid-ship portions are ready to be floated out of dock. For the illustrations to this article we are indebted to the courtesy of Palmers Shipbuilding and Iron Co. Ltd.

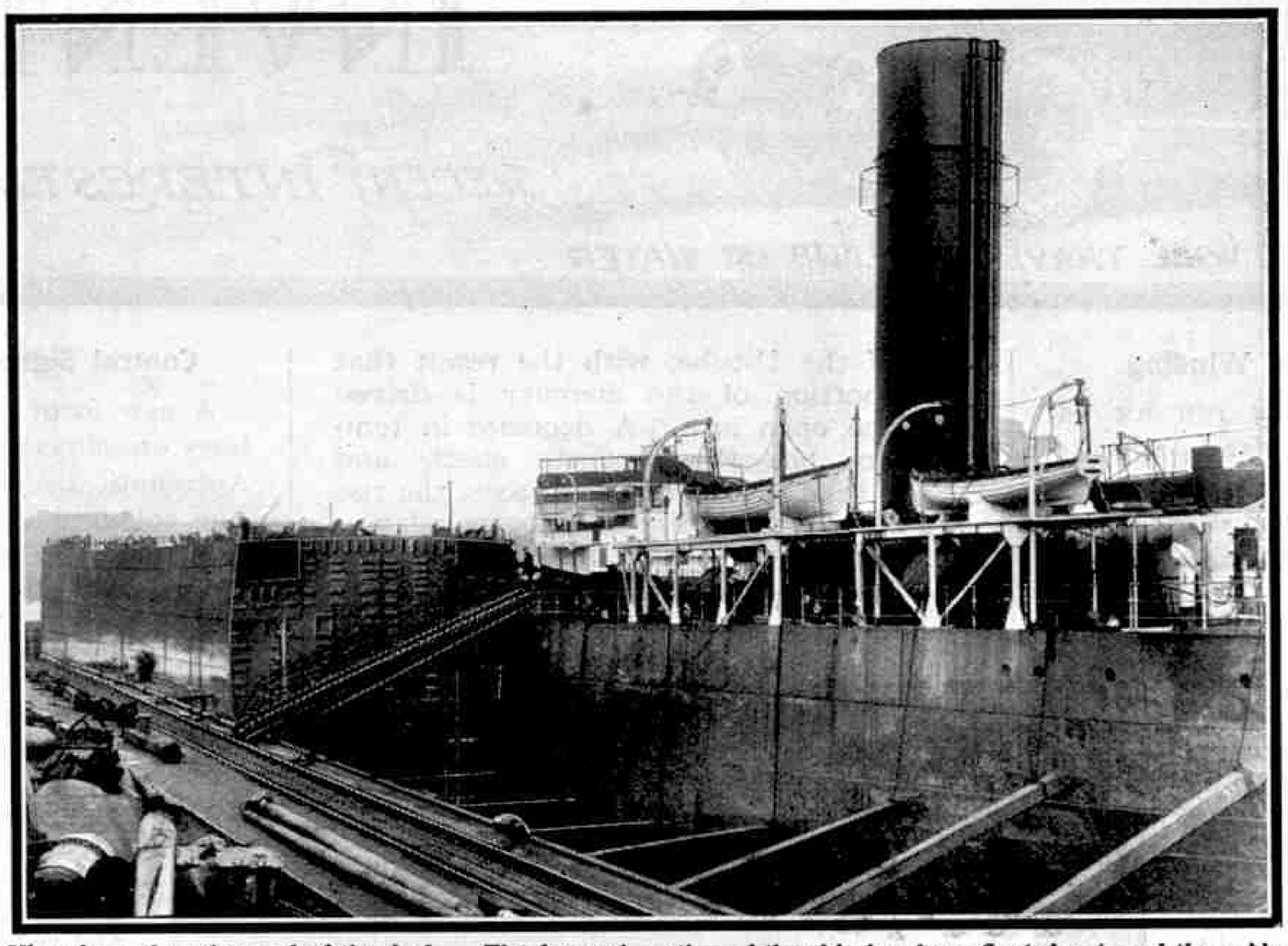
The company had useful work for these vessels to do, and if they had ordered new ships of the same size they would have had to wait over 12 months for them. They therefore decided to have a new middle part constructed for one of these vessels, the "*Cadillac*," and to let the vessel continue trading until this new part was ready. By this means they avoided expensive piecemeal repairs that would have delayed transport, and in any case would have been only a temporary cure.

When the new portion was ready, the vessel was laid off service for the very short period of seven weeks, during which time the new middle portion was fitted to her in the manner to be described. After this very short disturbance to her trading career she steamed away practically a new vessel. The cost of this work in a large ship is only about half the total cost of a new vessel of the same type and dimensions, so that it will be appreciated that the economic aspect of the scheme is an important consideration.

We come now to the actual programme of operations. The old vessel, which weighed over 7,000 tons, was brought into dry dock stern first. The dock was pumped dry, and then the work of cutting the ship into three pieces, by two clean cuts right round the

ship in two places, was undertaken by oxy-acetylene cutters, a good gap being left between each of the three portions. While the cutting was going on, an army of men removed the masts and rigging, together with such fittings on the old middle portions as were in suitable condition for incorporating in the new middle structure. These fittings were removed to various fitting shops for reconditioning before being brought back to go in place on the new piece.

Perhaps the most spectacular piece that was so removed was the whole of the three-storey bridge house containing the officers' accommodation. This structure, which weighed about 100 tons, after being disconnected was launched transversely on to the side of the dock, much in the manner that a ship is launched, except that the motive power was supplied by large winches. So gentle and smooth was this removal that one could have slept comfortably in one's cabin without knowing that one's abode was being moved bodily more than 100 ft. Actually the bridge was replaced in a different position on the new portion, which involved sliding the whole bridge structure along in the other direction also, and this was carried out by a similar method.



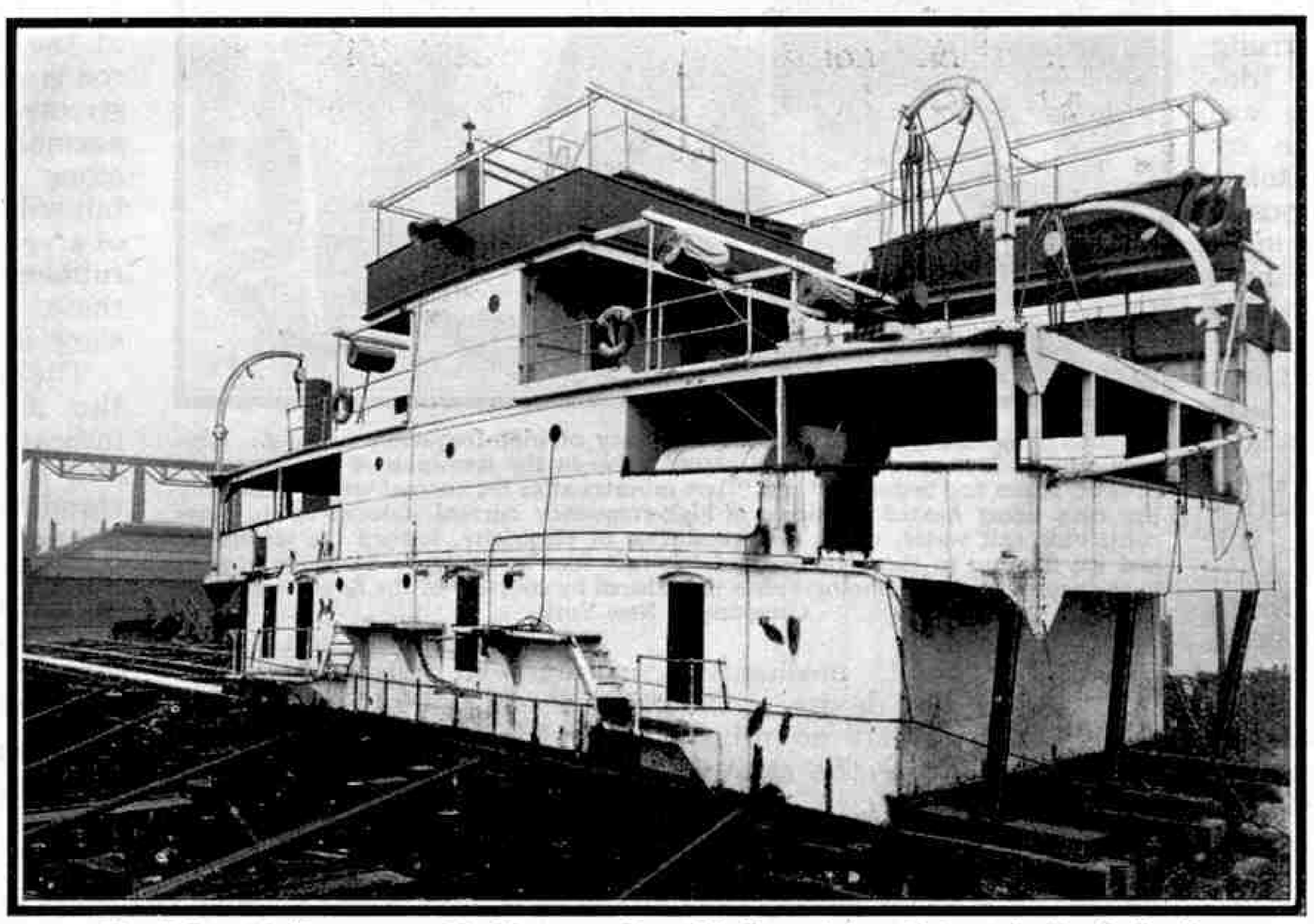
View from the other end of the dock. The forward portion of the ship has been floated out, and the mid-ship portion is about to follow.

When the vessel had been cut into three pieces, the aft end containing the propelling machinery was ballasted sufficiently to prevent it from rising from the blocks when the dock was flooded later. The old middle portion also was ballasted to assure that when it rose from the blocks it would not foul the other portions or the dock blocks. Then the fore end, which was a very awkward shape, had to be ballasted, not only so that it would not foul anything, but so that it would float on its own without turning turtle.

Some 15 days later all was ready for letting water into the dry dock again, which was done very gradually. The process was watched with some anxiety to see that the middle piece, over 300 ft. long and weighing about 4,000 tons, and the fore end, weighing about 800 tons, would rise, and the aft end "stay put," all in accordance with calculations; and that the fore end would not cock up and foul the middle piece and would behave itself properly in spite of the wind that was blowing.

All went well. The fore end flopped about a bit, but it was well under control, and when the water in the dock reached the same level as that outside, the dock gates were removed and the waiting tugs took hold of the fore end and moored it alongside the company's wharf. Then the tugs returned and towed out the old middle portion—a much easier proposition—and away they took it to be broken up and to provide a number of men with employment to cut it up into scrap sizes. That was enough for one day, and before the new middle piece was brought it had to be ascertained that the blocks remained in place properly to receive it.

On the following day was towed in the new middle piece that had been built and launched ready for the vessel's arrival. It was carefully adjusted in regard to position and trim, and then, when it was duly centred and in the correct position, the water was pumped out of the dock. The new portion settled on the blocks and was shored up, and after the dock was dry it was confirmed that this 4,000-ton piece of material was "well and truly laid."



The 100-ton bridge removed bodily more than 100 ft., and launched on to the dock side.

The new middle had now to be ballasted with several thousand tons of water so that it also remained on the blocks for docking the old fore end. Two days later all was ready for this, and the dock was again flooded. The ungainly fore end was brought in, and the same centring and checking of position gone through before the water was pumped out again. Then followed shoring up and the commencement in real earnest of the task of joining up the structure again. This joining up was not, of course, quite as simple as the straight cuts round the ship, and it involved the renewal of a

(Continued on page 314)

Clocks that Require No Winding

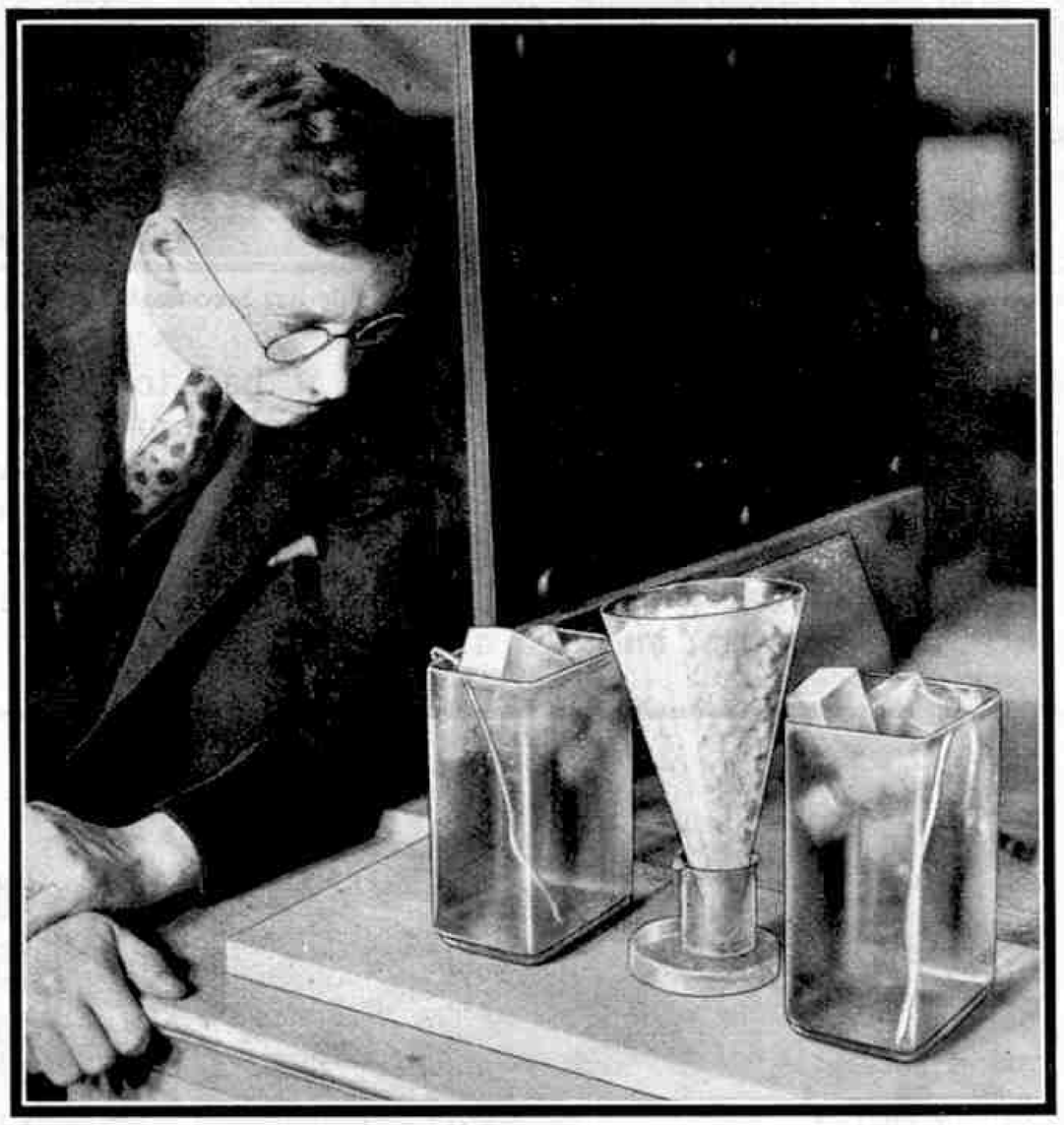
A clock that has already run for 14 years without rewinding, and appears capable of continuing to do so indefinitely, has been invented by a Swedish scientist. It is not claimed that the clock is an example of perpetual motion, however, for it is kept in operation by means of changes in atmospheric pressure.

The source of power in this extraordinary clock is a falling weight, the movement of which is transmitted to the hands by means of a train of wheels of the usual type, a pendulum regulating the rate of the clock. Below the ordinary mechanism is that employed for winding up the weight, and this consists of seven shallow boxes made from thin sheet metal. The lowest box is fixed to the case of the clock and the others are mounted above it, their interiors being connected in such a manner that they form one large airtight box built up in seven sections. The upper end of the pile is free to move, and falls when the pressure of the atmosphere rises above that in the interior of the boxes, rising when the outside pressure decreases. These movements are communicated to a spindle by means of two pawl and ratchet mechanisms that work in opposite directions. Thus the spindle always is turned in the same direction, and in turning it winds up the weight.

The working parts of the clock are very accurately made, and the hands are carefully balanced in order that little power may be needed to turn them. The action of the driving weight alone will keep the mechanism in movement for 18 months, and it has been found that the atmospheric energy available is four times that required to operate the clock.

An even more remarkable clock that is kept in operation by changes in atmospheric temperature has been invented by a Swiss engineer. This is so simple in character that it may be manufactured at little more than the cost of an ordinary timepiece.

The novel feature of this invention is a U-shaped tube containing mercury or quicksilver. One end of the tube is sealed, and contains a small quantity of a liquid that vaporises at a low temperature; while the other end is open. A rise in temperature causes an increase in pressure in the vapour of the liquid in the closed arm of the U-tube, with the result that a proportion of the mercury is driven into the open arm. A decrease in temperature has the opposite effect, and as the tube is pivoted on an axis, the rise and fall of the mercury disturbs its balance, causing a slow rocking movement. This is used to wind up the clock, the drive being transmitted by means of pawl and ratchet mechanisms similar to those in the device already described, and it is said that no difficulty is experienced in keeping the clock in operation.



An interesting demonstration of the efficiency of high-frequency heating. Pop-corn kernels in a transparent bag placed between the terminals of the generator gave off steam and began to " pop " two minutes after the current was switched on, the corn being heated by means of high-frequency current induced in it. Jars containing salt water, which is a conductor of electricity, formed the terminals, and ice floating in them emphasized the fact that no external heat was applied to the pop-corn. Our photograph is reproduced by courtesy of the General Electric Company of New York.

Rose " Invented " in America

An interesting American " invention " is a new variety of climbing or trailing rose tree that is characterised by an ever-blooming habit. The patent laws of the United States were amended in 1930 to cover cases of this kind, and the new rose, which has been called " *The New Dawn,*" is the first plant for which a patent has been granted. It is scarcely likely that a patent of this kind could be obtained in Great Britain.

Control Signals Operated by Traffic

A new form of traffic control signal for busy crossings has been introduced by the Automatic Telephone Company, Liverpool. The coloured lamps employed in this are similar to those of the indicators now in use, but instead of being changed at regular intervals they are altered when necessary by the approach of traffic. This result is brought about by means of a strip of rubber let into the roadway a short distance away from the indicator. The passage of the wheels of a vehicle over this momentarily closes electrical contacts that act through relays to switch on a green light instead of the red one normally shown. The action is delayed if another vehicle is already crossing at right angles, the device giving an uninterrupted passage to the first one entering the area controlled by it. Red lights are shown when the crossings have been accomplished and these continue to be visible until other vehicles are driven over the rubber strips.

It is expected that the new form of control will be largely used at the intersections of busy main roads with less important side streets. In that case, traffic normally will be allowed to pass along the main thoroughfare, but will be stopped on the approach of a vehicle along a side street, the rubber strips being placed only in these, although signal lights will show in four directions.

The mechanism that operates the signal lamps of the new indicator has no moving parts and is contained in a small box standing at the side of the road. It is unaffected by temperature and weather conditions and is already in use in many American cities, where a great decrease in the number of accidents taking place at busy crossings has followed its introduction.

For Cleaning Motor Cars

A device for use in washing motor cars that has recently been introduced consists of two arms, about 18 in. in length, that may be opened out or brought together, like those of a pair of tongs, by moving a sliding collar. The inner sides of the arms are provided with teeth to enable them to hold a swab or cleaning cloth, and a convenient handle is provided. The invention is called the Avecta Tongs, and may be used to remove mud and dirt from awkward corners that cannot readily be reached by means of ordinary brushes.

Electric Lamp with Two Filaments

An electric lamp with two filaments has been introduced in America, and is illustrated on this page. It is chiefly intended for the use of miners. No provision is usually made for replacing lamps burned out underground, and when his lamp fails the miner must be given a new one or be sent to the surface in order to have the necessary renewals made. The introduction of the new lamp makes this unnecessary.

Current for both filaments in the lamp is supplied from a small 4v. battery that may be strapped to a belt about the miner's waist. The principal filament gives a beam of 14 c.p. and is used until the battery is nearly exhausted. Warning of this is given by the dimming of the light, and the current is then switched to an emergency filament that has a lower rate of consumption. This gives a light that is sufficient to enable the miner to complete his day's work, although it is of low candle power. The emergency filament will remain in operation for 30 hours or more, and will be particularly useful to miners who are compelled by accident to remain underground for an unusual length of time.

Kettle That Cannot Boil Over

An ingenious device is a kettle that cannot boil over, the invention of Mr. R. F. Morgan, East Grinstead. The usual cause of the boiling over is the accumulation of steam in the upper part of the kettle, the pressure of which forces the boiling water out from the spout. In the new kettle an interior flange round the opening at the top marks the highest level to which the kettle should be filled. A place is thus provided in which the steam may accumulate, and slots in the flange itself and in the lid allow it to escape. The slots in the lid direct the steam backward in order that it may not scald the hand of the person lifting the kettle. We have tried this kettle and find that it is efficient and satisfactory if the simple instructions given are followed.

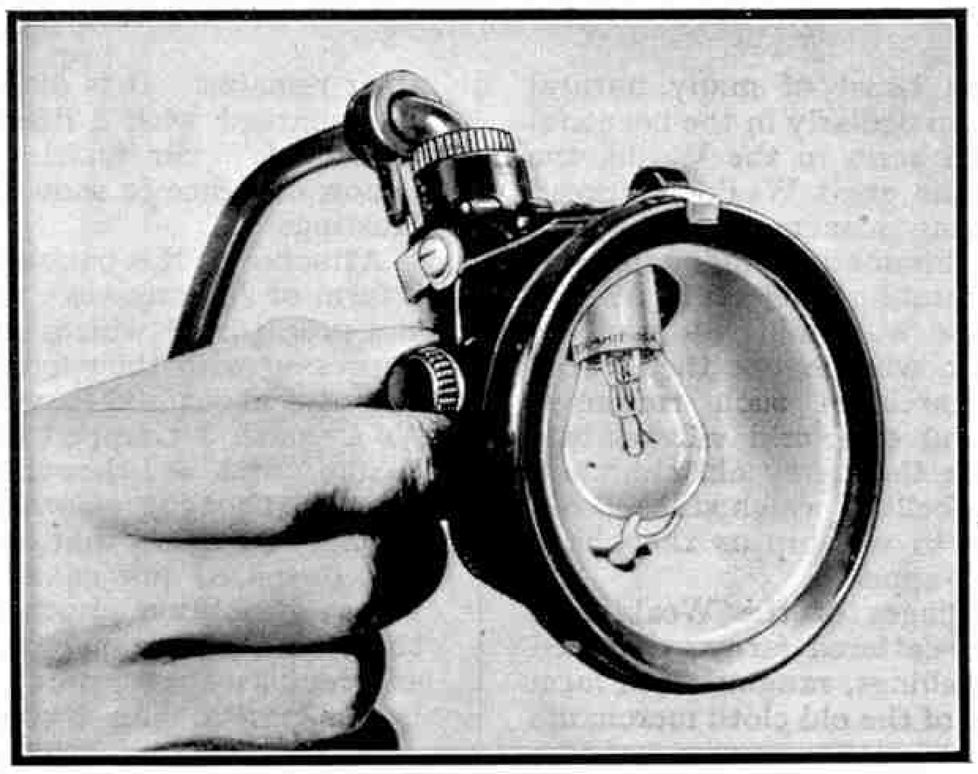
Automatic Arm for Oven Shelves

A simple but useful invention known as the "Autoarm" has been introduced in order to make the withdrawal of shelves from a heated gas oven easier and safer. It consists of a rod fitted at right angles to the oven door in such a position that it swings forward as the door is opened. This movement causes it to bring the shelf halfway out of the oven with its front resting on the rod itself. The contents of the shelf may then be removed without difficulty, and there is practically no risk of injury from contact with the hot metal. A separate arm may be fixed under each shelf in a large cooker.

Giant Clock Times Football Matches

Some time ago a large clock was installed at the ground of the Arsenal Football Club at Highbury, London, in order to keep spectators in touch with the progress of the game. Unfortunately this did not meet with the approval of the authorities, and its use for this purpose had to be abandoned. It is interesting to find that a similar clock has been installed at the Harvard Stadium. The pointer of this clock makes a complete revolution in 15 minutes, the duration of a game of American football being divided into four periods of this length.

The Harvard clock is electrical, and is connected with a small control clock operated by the official time-keeper. He switches the clocks on at the beginning of each period, and if time is taken off because of an accident, or for any other reason, both are stopped, to be restarted when play is resumed. A glance at the dial of the large clock therefore shows at a glance the exact time remaining for play in each quarter.

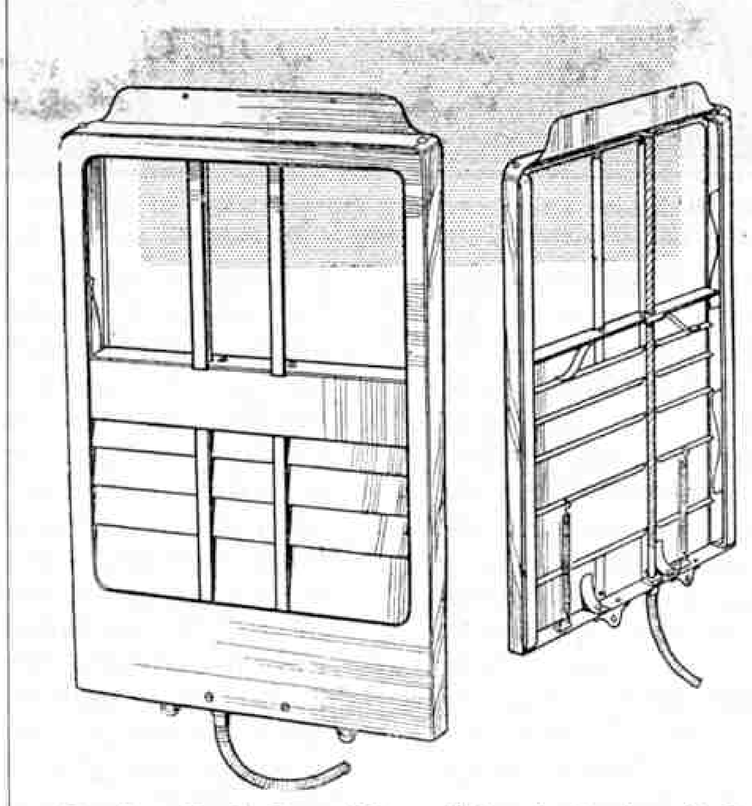


Turning the switch that changes the filament in use in the miner's lamp described on this page. For this photograph we are indebted to the Westinghouse Electric Company.

A Simple Radiator Shutter

Among recent patents is the simple and ingenious radiator shutter illustrated on this page. It is readily controlled by means of a small handle that may be mounted conveniently near the driver's seat, and may be fitted on any motor car, or incorporated in the design of different forms of radiators.

The shutter consists of a number of sheet



Front and back views of the radiator shutter described on this page. Illustrations by courtesy of the inventor, Mr. R. V. Howard, London.

metal slats. The top slat is fitted with a nut working on a vertical threaded rod that is turned by means of the control handle. As it rises it draws the remaining slats after it, for the bottom edge of each is turned up in order to fit into the similarly-shaped upper edge of the next. Turning the rod in the opposite direction causes the slats to fall to the bottom of the radiator, where they are out of the way. Springs guide the movements of the slats, and any required proportion of the radiator may be screened off.

Detecting Transformer Faults

An interesting invention by means of which a transformer sounds an alarm when faults develop has recently been introduced. It is called the Buchholz Relay, and consists of a small receptacle that is placed at a suitable point in the oil cooling system. If the oil becomes overheated, bubbles of gas are trapped in this receptacle and cause the level of the oil in it to fall. When this happens a float causes a bell to ring, or a buzzer to sound, by closing electrical contacts.

The device also is capable of cutting off the current through the windings of the transformer if these become dangerously overloaded. When a very serious fault develops, large bubbles of gas are formed by the rapid overheating of the oil near the coil concerned. As these large bubbles pass through the Relay they impinge on a second float anchored to the bottom of the trap and press it sideways. In this position the float switches in electrical circuits that cut out the transformer before serious damage results.

Improved Piston Prevents Detonation

An interesting new form of piston introduced for use in high-speed oil engines contains a small air chamber in its head. The purpose of this is to prevent detonation, an extremely rapid and violently explosive form of combustion that imposes great stresses, and it is used in oil engines made by John Fowler & Co. (Leeds) Ltd.

When a piston of the new type is at the top of its range and the firing stroke is about to commence, the air available is insufficient for the complete burning of the fuel injected. Its combustion is therefore retarded, and is only completed when the additional air necessary is supplied from the chamber in the piston head as soon as the piston commences its downward motion. The burning of the charge therefore is comparatively gradual, and detonation is impossible.

Tests have shown that the combustion of the fuel is more complete in cylinders fitted with the new piston than in those in which the ordinary type are employed, and the greater turbulence that follows its use adds to the efficiency of the engines.

Radiator Shells Shaped by Compressed Air

The Westinghouse Electrical Company have introduced a novel method of making radiators for use with transformers. Long strips of steel 1/20th in. in thickness are placed back to back and the narrow space left between them is made airtight by welding round the rims. The flat metal container formed in this manner is then placed between the retaining walls of a jig, and is expanded into a light steel shell by blowing in air at a pressure of 90 lb. per sq. in. Several sections of this type are grouped into a common header in order to form the radiator itself, to which strength is given by a welded seam down the centre of each section.

Radiators formed in this manner are very effective, the thin metal shells rapidly losing the heat absorbed from the oil circulating round transformers fitted with them. They do not rust or corrode easily, for there are no places in which water can stand; and they are easily inspected, the welds requiring supervision being on their outside surfaces.

An Old Kentish Village Ceremony

The "Biddenden Maids" Charity

By W. Coles Finch

KENT can boast of many natural gifts, particularly in the beautiful wooded acres in the Weald, the remains of the great Wealden Forest. Its undulating scenery; meandering rivers and shimmering millponds and pools; its rumbling weirs and derelict windmills and watermills, all fascinate the traveller who leaves the beaten track in search of such treasures. The delightful old-world villages and hamlets with their grey old churches, the chiming bells of which still tell out the fleeting hours or call the villagers to worship as they have done for centuries, all have their special appeal.

Collectively and individually the villages of the Weald still possess the greatest charm, with their scattered farms, thatched barns, and a wealth of old timbered dwellings, ranging from farm cottage to the more elaborate structures of the old cloth merchants and the Manor Lord. Thickly dotted over the countryside one finds innumerable ponds of all sizes, generally margined by trees, glorious with wild water-loving flowers, and beautiful when mirroring the passing clouds, or at evening when reflecting an inverted picture of every object near at hand. These ancient ponds originated in the cavities left in the digging of marl for agricultural purposes, or Fuller's earth that was used in the cloth-weaving industry, or for clay-daub for covering the lath walls of the timbered houses and for the making of bricks for the tower-chimney stacks.

The top illustration shows the Biddenden Cake bearing a representation of the twin "Maids." In the centre is seen the Clothworkers' Hall, Biddenden, and below is the signpost at the entrance to the village.

Each village has its own peculiar associations, its stories, its own special ghosts, and its historic connections with smuggling, riots, rebellions and other notable happenings. We are now particularly interested in the parish and village of Biddenden, lying on the Maidstone to Tenterden road. On approaching the village from the direction of Maidstone there will be seen on the right the old cloth-workers' houses, an imposing block of gabled dwellings, recalling the year 1337 when the Flemish weavers were invited to settle in Kent, and tempted by the promise of wealth and the daughters of the richest yeomen as wives. They came and prospered, and all went merrily until 1616, when the export of white cloth from England was prohibited. By the 18th century all making of cloth as an industry was at an end in Kent.

At the entrance to the village street will be found a small triangular shrubbery, by the side of which stands a tall white post on which is erected the figure of the famous Biddenden twins. Turning sharp to the right one enters the quaint but picturesque old village street, with its wide cobblestone footpath, at the end of which is the church of All Saints. This, curiously enough, has its clock not in the centre of the tower but at the side. On the left are more dwellings, delightful old houses, where dwelt the Flemish cloth workers.

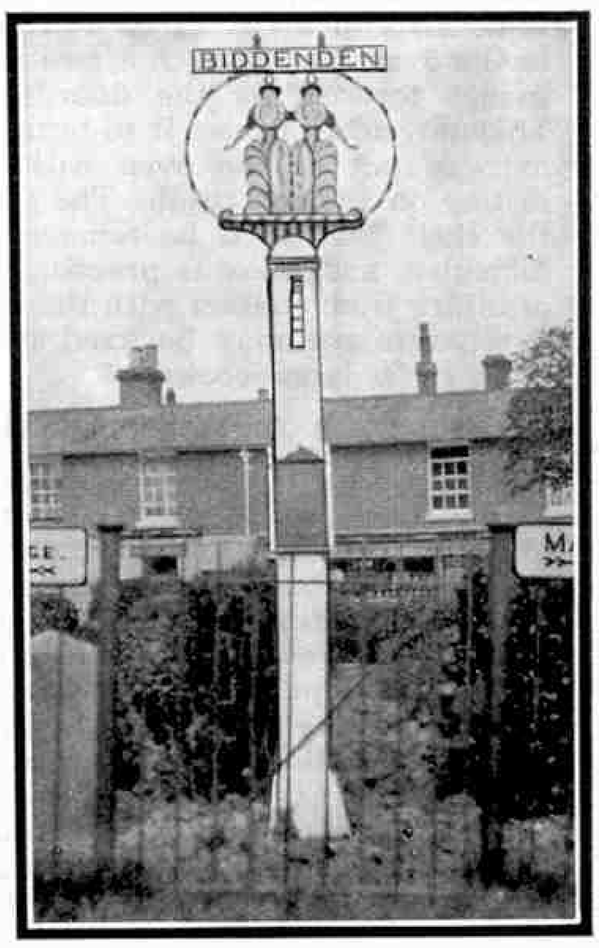
Here were born in the year 1100 the twins Elizabeth and Mary Chalkhurst, known as the "Biddenden Maids," who at birth were joined together at hips and shoulders. In this state they lived to the age of 34 years, when one died. Her sister refused to be separated from the body, saying: "As we came together we will also go together"; and about six hours later she also died. The churchyard at Biddenden at one time was supposed to contain their remains. It is also stated that "a stone near the Rector's pew marked with a diagonal line is shown as the place of their interment." Sir Charles Igglesden tells us, however, that there is now evidence to show that the bodies were buried at All Saints, Hastings.

Attached to this parish is a benefaction of great celebrity. This is a farm of 23 acres that was left by the "Biddenden Maids," from the proceeds of which, in accordance with their will, 1,000 rolls impressed with their figure are distributed to strangers at Easter, and also about 500 loaves, with cheese, to the poor of the parish. As a youth I tramped to Biddenden and obtained my gift of a "cake" and, as I thought, preserved it carefully for half-a-century. When I thought of writing this article I went to the place of hiding, and found that a wily mouse had long since forestalled me and devoured my cake! Last Easter Day I again visited the village to obtain another cake, and was disappointed to learn that the distribution was now made on Easter Monday, and not as previously on Sunday after the special sermon was preached in the parish. As I could not again attend, an old lady from one of the ancient weavers' houses in the village forwarded me her cake on the following day, and I reproduce here a photograph of it.

This charity is now subject to the terms of a new scheme of the Charity Commissioners dated March, 1907, but the small flat flour-and-water biscuits or cakes bearing the impress of the "Biddenden Maids" are still distributed.

Being interested in windmills as well as in cakes and loaves, I recently sauntered from the church to the old windmill near by, where I presume the corn was ground and the flour made at the time I received my cake. I found the mill an idle but picturesque derelict, and something prompted the thought that the flour for my cake of half-a-century ago came from the old windmill. I recalled that it was of a warm cream colour, a more tempting creation than the pale anæmic make of 1931 bake. I concluded that the present pale substitute was not made from English wheat from the surrounding harvest fields. Perhaps my imagination led me astray, for one is always apt to think that what one has lost, whether by marauding mice or otherwise, was far better than what one now has. If I am wrong, and no foreign dumped flour was in my cake, I beg the pardon of the Biddenden miller, and feel quite sure that he will willingly grant it!

The journey to obtain a Biddenden Cake is well worth making, for on the way there is much to be seen of the beauties of rural England.



AUTOMATIC RECORD-CHANGING

DURING the past few years the gramophone has steadily improved in regard to accuracy and quality of reproduction, but until recently it has not been made automatic in action. There has remained the disagreeable necessity of having to leave one's comfortable chair at frequent intervals to re-wind the motor, or to stop it in order to turn over the record or substitute a fresh one. The first drawback has been eliminated by the introduction of electric motors in place of clockwork mechanism. The motor is simply connected with the mains by means of a plug and a length of flex, and smooth and silent continuous running at unvarying speed is obtained without the slightest trouble and at negligible cost.

The second drawback, that of having to reverse or change the record by hand, is more difficult to deal with. With the large number of records that occupy only one side of a disc the trouble is scarcely noticed, for an interval naturally follows the completion of the record. The case is different, however, with records of long musical works that occupy both sides of two or more discs. Here the reversing and changing becomes a nuisance, and with records of complete operas filling several discs, or with a work such as the "*Eroica*" symphony of Beethoven recently recorded by the New York Philharmonic Orchestra on seven 12 in. discs, a great deal of the enjoyment of the music is inevitably lost.

The mechanical difficulties of producing effective automatic changing are many, one of the greatest being that of ensuring that records shall be protected from damage during the change. The first efficient system was produced by the Gramophone Co. Ltd., nearly four years ago. It was perfectly reliable in action and simple to operate, but the mechanism was somewhat elaborate, and the "His Master's Voice" instrument in which it was fitted was necessarily expensive. Since that time "H.M.V." experts have been engaged in the task of simplifying the mechanism, and they have developed an apparatus that is remarkable for its absence of complications.

The new mechanism has recently been incorporated in a cabinet playing desk, known as "H.M.V." Model 117. This desk, which is sold at 18 guineas, enables owners of wireless sets, electrical reproducers, and radio gramophones to convert their instruments to automatic changing. It consists of a walnut cabinet fitted with the new type H.M.V. No. 15 pick-up, complete with tone arm and a volume control. The operation of the mechanism is extremely simple, and will be readily understood from the accompanying photograph. This shows the mechanism fitted to the magnificent H.M.V. 70-guinea radio-gramophone, but the method of operation is similar to that in the desk.

The records are stacked on a platform consisting of two sliding arm erections, and are located in the correct position by an extended central spindle. The sliding arms release the records one at a time, so that they drop vertically on to the turntable. The release movements are synchronised with those of the tone arm, the mechanism being brought into action as soon as the needle comes on to the eccentric groove at the end of the record, or within a mean diameter from the centre. The changing operation occupies about eight seconds. Up to eight 10 in. or 12 in. records, not mixed, may be played at one loading, or one record may be repeated eight times if desired. On the front of the instrument are fitted a volume control, and a record-changing button by pressing which a new record may be placed on at any time. During changing the pick-up is cut out to eliminate unwanted noise.

This mechanism brings us within sight of the perfect gramophone, but there remains the drawback that only one side of each record is played. This defect is eliminated in a large proportion of H.M.V. recordings of complete works, occupying several discs, by means of special couplings that bring successive sections of the record into correct sequence for automatic playing.

The automatic record-changing mechanism described in this article, shown fitted to the "H.M.V." super-heterodyne radio-gramophone. Photograph by courtesy of the Gramophone Co. Ltd.

The "H.M.V." 1932 Catalogue

The 1932 edition of the "*His Master's Voice*" record catalogue is a remarkable publication. It consists of over 400 well-printed pages, with a cover bearing a reproduction of Metsu's fine picture "*The Music Lesson*" from the National Gallery. The arrangement of the catalogue follows the general plan that has proved so successful in earlier editions, but it has been considerably simplified by the inclusion in the main body of the catalogue of the red label records. The catalogue of records of unique and historic interest printed on the familiar green paper is again incorporated. A special photogravure supplement contains brief biographical sketches and photographs of more than 100 of the most famous "H.M.V." artists. The pronunciation guide will be of assistance in pronouncing the somewhat weird-looking names of many foreign composers and performers, and the lists of selected records, to which three pages are devoted. should be valuable as a basis for commencing a library of first-class records.

The Filmophone "Longanote"

The interesting announcement comes from Filmophone Ltd., of the production of a gramophone and records that will reproduce 18 minutes' music from a 12 in. gramophone record, and 12 minutes' from a 10 in. record. This is achieved by a system that enables the speed of the gramophone turntable to be governed so as to maintain a constant linear speed, the needle travelling at 18 in. per second from start to finish.

Gramophone music is produced by vibrations conveyed to the sound-box or pick-up by the needle traversing a small continuous playing groove cut spirally on the gramophone record. If the groove on a 12 in. record could be straightened out it would be found to be approximately 500 ft. long, and when the record is played through, the needle traverses this 500 ft. in about four minutes. The ordinary record runs at what is known as a constant "angular" speed, that is, the turntable rotates steadily at the constant speed usually of 78 r.p.m. from start to finish. At the commencement of the record over 50 in. of groove surface pass the needle each second, but as the spiral decreases in diameter the speed falls steadily until, at the end of its run, the needle may be traversing as little as 10 in. per second. This latter speed, it is claimed, is too slow, and the initial speed too high, for perfect reproduction. The Filmophone "Longanote" gramophone overcomes the difficulty by controlling the speed of the turntable so that, wherever the needle happens to be on the record, the speed of the groove under the needle remains constant. In other words, the gramophone motor gradually speeds up as the needle travels towards the centre of the record. Filmophone "Longanote" gramophone records employ a constant linear speed of approximately 18 in. per second from start to finish, which is stated to be well on the safe side and to give no cause for anxiety in either reproducing or recording.

Further particulars of the "Longanote" gramophone and records will be awaited with interest. In the meantime we are informed that there is a "Longanote" radio gramophone available at a price of 48 guineas, and a "Longanote" gramophone unit for conversion purposes at eight guineas.

Some Good "Columbias"

Recent "Columbia" issues include a spirited rendering of the popular "*Stradella*" overture by Flotow, played by the Bournemouth Municipal Orchestra under Sir Dan Godfrey (DX326, 12 in., 4/–), and a good half-crown record by Albert Sandler and his orchestra of two descriptive Russian pieces (DB752, 10 in.). Dennis Noble, baritone, sings in good style two of the "*Freebooter Songs*" of William Wallace, "*Son O' Mine*" and "*The Rebel*" (DB750, 10 in., 2/6). These songs ought to be in all gramophone libraries. By way of contrast Rudy Starita does surprising things with xylophone, vibraphone and bells in "*When the Circus Comes to Town*" and "*Magic Notes*" (DB742, 10 in., 2/6). Finally, if you want a good laugh I recommend Haver and Lee in their humorous sketch "*A Smash and Grab Raid.*"

The Rebuilt "Claughtons" of the L.M.S.R.

Additional 0–8–0 standard freight locomotives have been turned out from the works at Crewe and are numbered 9635 to 9644. A further batch of these engines is included in the building programme for the present year.

Almost all the 4–6–0 engines of the "Royal Scot" class have now been fitted with smoke deflector plates on both sides of the smoke-box. These side sheets have proved an effective cure for the evil of "drifting" and have given great satisfaction to the enginemen. Some express engines of other classes are now being equipped with similar deflector plates. The reconstructed "Claughton" or "Baby Scot" No. 5902, "*Sir Frank Ree*," has already been fitted with them, as have also two of the "Caprotti Claughtons"—No. 5948, "*Baltic*," and No. 6023, "*Sir Charles Cust.*"

In the "*M.M.*" for February last, it was stated that a correspondent had noted that when starting, No. 5927, "*Sir Francis Dent*," one of the "Caprotti Claughtons," gave eight puffs of the exhaust to one revolution of the driving wheels and that therefore it must have a special setting of its cranks. It can now be added that when they were rebuilt, four of the "Caprotti Claughtons"—Nos. 5927, 5957, 6023 and 6029—had their cranks altered and set in that particular manner—a setting similar to that adopted on the "Lord Nelson" engines of the Southern Railway. Of the 20 "Claughtons" that have been rebuilt with larger boilers, 10 have been fitted with Caprotti valve gear. Their numbers are:—5908, 5927, 5946, 5948, 5957, 5962, 5975, 6013, 6023 and 6029. The other 10, which still have the original Walschaerts valve gear, are numbered 5906, 5910, 5953, 5970, 5972, 5986, 5993, 5999, 6004 and 6017. There are also the two completely reconstructed "Claughtons"—Nos. 5902 and 5971—which have three cylinders in place of the original four.

No. 5902, "*Sir Frank Ree*," is still stationed at Longsight shed, Manchester, and continues to take a full share in working the fastest and heaviest expresses between that city and London. It has now run a considerable mileage since reconstruction and has been thoroughly tested with very satisfactory results. It has proved very economical and efficient in operation and has won enthusiastic praise from the enginemen who have had charge of it. In proof of its capability and economy in service, two carefully recorded test runs may be quoted. On the up "*Mancunian*," which runs non-stop from Wilmslow to Euston (176.9 miles) at an average speed of 56.8 m.p.h., time was well kept with a load of 390 tons behind the tender and with a coal consumption of only 30 lb. per mile. On a return trip with the 11.50 a.m. express from Euston, loaded to no less than 430 tons, schedule time was again kept, the coal consumption being only 32 lb. per mile.

It is said that more engines of this type are to be built or reconstructed, and in view of these performances mentioned above it would certainly seem that they are worthy of multiplication.

"The Merseyside Express" leaving Mossley Hill, Liverpool, on its non-stop run of 189.7 miles to London. The locomotive is No. 6147, "Courier," of the three-cylinder 4-6-0 "Royal Scot" Class usually employed on these trains. For this photograph we are indebted to A. D. Atherley of Liverpool.

New Engines of "Schools" Class for S.R.

Two more 2–6–4 tank engines of the "W" class have been completed at Eastleigh and are numbered 1913 and 1914. Some of the new 4–4–0 engines of the "Schools" class are well in hand, but it is not expected that any will be ready for service before the early summer.

Speed Trials on L.N.E.R.

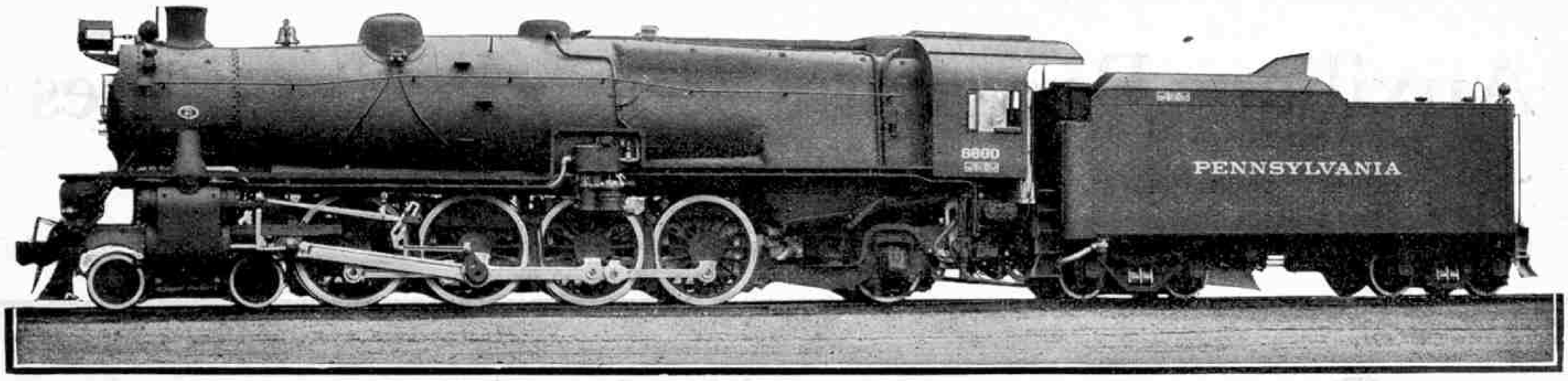
In the "*M.M.*" for the past two months accounts have been given of special speed tests that have been made on the G.N. and G.E. sections of the L.N.E.R. Further tests have been made on the G.E. line between Liverpool Street and Southend-on-Sea. For these runs, as for those to Cambridge and Norwich, the engine employed was the three-cylinder 4–6–0 locomotive No. 2800, "*Sandringham.*"

The first trial run was from Southend to Liverpool Street, when the departure of the 9.17 a.m. train was purposely delayed for 12½ minutes to ensure a clear path. In spite of this, Liverpool Street was reached at the scheduled time of 10.17 a.m., the distance of 41.5 miles having been covered in 47½ minutes, including a stop of one minute at Prittlewell and three severe and two slight service slacks. A maximum speed of 79 m.p.h. was attained between Rayleigh and Wickford. The load was 295 tons.

A day or two later a test was made on the down train that is timed to leave Liverpool Street at 5.22 p.m. Although the start was a minute late, so smart was the running that Southend was reached seven minutes early, stops having been made, according to schedule, at Rayleigh and Prittlewell.

Improved Coaches for "*Flying Scotsman*"

The L.N.E.R. continue to make travel on their "*Flying Scotsman*" express increasingly attractive and have now included in that train some new third-class coaches in which the compartments are fitted with intermediate arm-rests to the seats. When the arm-rest is down, a single seat and a double seat are provided on each side. If traffic is heavy, however, the arm-rest can be folded back flush with the back of the seat, and four seats are available instead of three. A new and more comfortable type of upholstery has also been introduced in these coaches, while the interior decoration, in soft shades of blue and grey, is particularly pleasing and restful.



G.W.R. Locomotive News

Engines of the "5400" class, the new type of 0–6–0 tank locomotive built at Swindon works for accelerated "Auto" push-and-pull services, are fitted with the G.W.R. standard No. 21 boiler, having a total heating surface of 1,086 sq. ft. and a grate area of 16.76 sq. ft. The coupled wheels are 5 ft. 2 in. in diameter, and the cylinders have a diameter of 16½ in. and a stroke of 24 in. The water capacity of the tanks is 1,100 gallons. The working pressure is 165 lb. per sq. in. and the tractive effort is 14,780 lb. Several of these handy engines are already in service and more are to be built.

Another of the 2-cylinder 4–6–0 express engines—No. 2919, "*Saint Cuthbert*"—has been scrapped. This engine was built in 1907 and at first bore the name "*Saint Cecilia.*" Almost immediately, however, the name "*Saint Cuthbert*" was substituted. General regret is felt that these fine locomotives are being withdrawn from the road, where for many years they have done such praiseworthy work. They have had a good reputation among their drivers who have always spoken of them as well-balanced engines that could be depended upon to respond when an extra effort was required.

L.N.E.R. Main Line Widening

The L.N.E.R. has begun its big scheme of widening the Liverpool Street and Colchester main line between Gidea Park Junction and Shenfield, the junction for Southend. This extensive project, which is to cost £800,000, will take two years to complete and will give employment to 1,000 men. The section now being widened is six-and-a-half miles long and is a continuation of the recently-finished widening from Romford. On completion of the scheme, four lines of metals will be available from Liverpool Street to the junction of the Southend lines near Shenfield. It will provide the main line expresses with special tracks clear of local and slow traffic. A new single line of railway, nearly one mile long, on the down side, will pass under the Colchester line and form what is known as a burrowing junction with the Southend branch beyond Shenfield. Three stations will be reconstructed, and 22 bridges are involved.

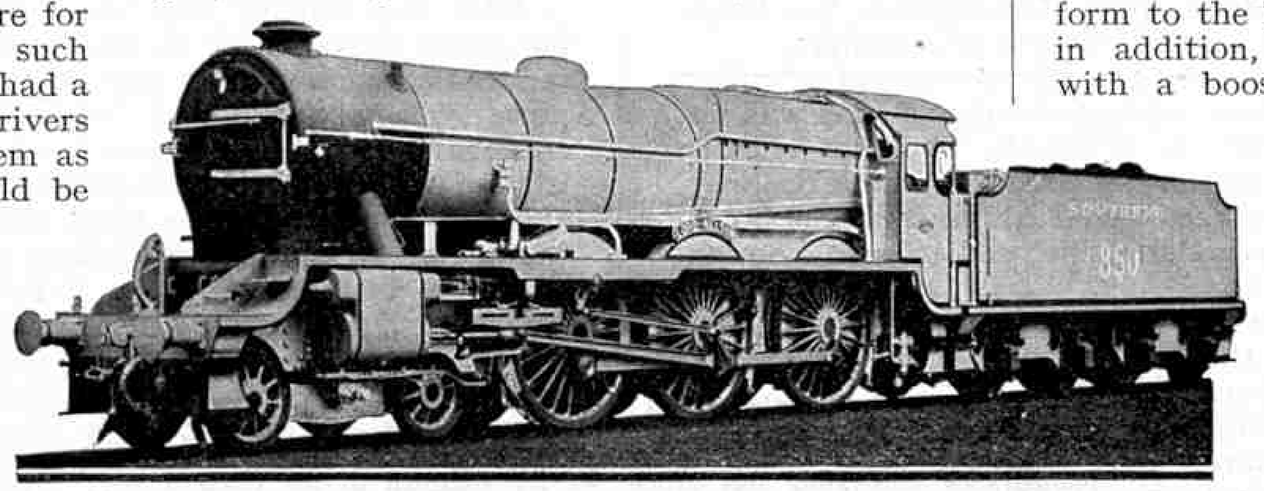
During the progress of this scheme, the time-keeping of trains passing over this section is bound to be adversely affected as low speed limits will be enforced. Everything possible will be done to reduce delays to a minimum.

New P.O. Sorting Vans on the L.M.S.R.

Some new travelling post office sorting vans have been built at the L.M.S.R. carriage works at Wolverton. They are equipped with all the latest improvements for the swift handling of mails and for the convenience of the men engaged in that exacting work. The new vans have a length of 60 ft., a width of 8 ft. 8 in., and an inside height of 8 ft. 0¼ in. They are painted in the standard colours of the L.M.S.R. and have the words "Royal Mail" in bold lettering on each side.

Pneumatic-Tyred Rail-Car on L.M.S.R.

A rail-car fitted with Michelin pneumatic tyres and driven by petrol has recently been put through a series of trial runs on the L.M.S.R. line between Oxford and Bletchley. The car, which showed exceptional powers of acceleration and braking, was able to improve decidedly on the usual schedule for trains on this line. For the 19½ miles from Bletchley to Bicester, including six intermediate stops, the normal allowance is 42 minutes. The "Micheline," however, performed the journey in 31 minutes. The car has accommodation for 24 passengers and is capable of a maximum speed of 60 m.p.h., yet weighs only five tons. It is similar to the one used on the French State Railways, as reported in the "*M.M.*" for September last.



In the upper illustration on this page a "Mountain" type locomotive of the Pennsylvania Railroad is shown. Contrary to the usual American practice, a fire-box resembling the Belpaire in shape is a feature on this line. Our lower illustration shows the well-known S.R. locomotive No. 850, "Lord Nelson." The 16 engines of this class are used for the most difficult express duties.

Speedy Station Work

Those interested in electric traction frequently put forward the claim that its adoption results in a considerable reduction of delay at terminals. Smart working with steam trains recently recorded in the "*Railway Gazette*" therefore is of interest. One evening the passengers of a local train arriving at King's Cross were detrained, the engine was detached and another one coupled on in front, the outgoing passengers were taken up and the train hauled out of the station on its return journey in 70 seconds. The following evening another train was similarly disposed of in 73 seconds.

New Locomotives for the L.N.E.R.

The L.N.E.R. programme of new construction for the present year provides for the building of 42 tender and twelve tank locomotives, all of which are to be constructed in the Company's own workshops. Five more super-Pacifics with high-pressure boilers are to be built for use in the Scottish area. Six additional engines of the 4–6–0 "Sandringham" class are to be built for the express services between London (Liverpool Street) and East Anglia, and 10 freight tank engines of an entirely new design, having the 2–8–2 or "Mikado" wheel arrangement, are to be constructed for hauling heavy mineral trains in the Nottingham area.

The orders for the year also include two 0–8–4 tank engines for working in the new down "hump" marshalling sidings now under construction at Whitemoor. These will be generally similar to the former G.C.R. engines of this type, but the boiler fittings and other details will conform to the latest L.N.E.R. practice and, in addition, each engine will be fitted with a booster driving on the trailing bogie wheels and giving a valuable increase of power at starting or on heavy gradients.

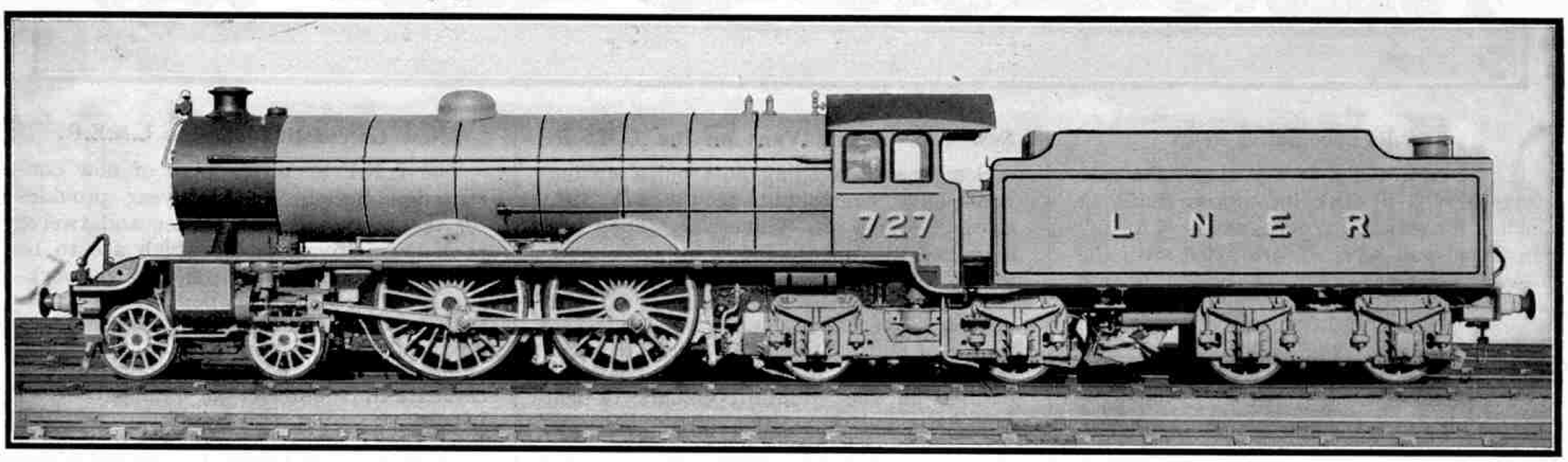
New Rolling Stock for the "Brighton Electric"

The Southern Railway have placed an order for 44 third class electric motor coaches for use on the extension of the electrified services to Brighton and West Worthing which are to come into operation in the early part of next year. The new vehicles are of all-steel construction and are 63 ft. 6 in. in length by 9 ft. in width. The driver's compartment is equipped with a window wiper and pivoted seat, and next to it is the vestibule entrance to the main passenger saloon, which is divided into two sections—smoking and non-smoking. The saloon is provided with a central corridor, and removable tables are placed between each pair of seats. In order to lessen the noise, cork slabbing is secured to the steel floor plating and linoleum is laid over the cork with sponge rubber strips down the centre corridor.

The coaches are fitted with large balanced windows and ventilators are provided above each window and along the centre of the roof. The coaches will be heated by means of electric radiators and the lighting arrangements are of the most up-to-date methods in order to give the greatest comfort to passengers when reading. Their appearance will be awaited with interest by those who are following the progress of the scheme.

Auxiliary Power for Steam Locomotives

Booster Development on the L.N.E.R.



Above is shown L.N.E.R. No. 727, one of the locomotives recently fitted with an articulating booster-driven bogie between engine and tender. It was originally built in 1911 as one of the former North Eastern class "Z" "Atlantics," but was reconstructed last year. For this and the other photographs illustrating this article we are indebted to the L.N.E.R.

IN locomotive history we frequently come across instances of engines that were becoming incapable of dealing with increasing loads, and that were given a fresh lease of life by being rebuilt with new and perhaps larger boilers, and possibly with some enlargement of the cylinders. In more recent times the addition of a superheater has often been made where conditions were favourable to its installation, with a corresponding increase in the efficiency of the engines concerned, even though this might not reach the standard set by more up-to-date locomotives. The growth of train loads and the increased speeds at which they are hauled have evolved the modern steam locomotive, the large-boilered, six-coupled giant with which we are all familiar.

Methods of obtaining more power naturally demanded attention in quite early days, and a particularly interesting scheme was put into practice for a time by Mr. A. Sturrock, who was once in charge of Doncaster Works on the former Great Northern Railway. This line always carried a very heavy coal traffic from the South Yorkshire, Nottinghamshire and Derbyshire collieries to London, and of course as part of the L.N.E.R. it still does so. One of its chief objects in fact, as the proposed London and York Company in 1841, was to deal with coal from these districts. A more powerful locomotive was desired by Mr. Sturrock for the haulage of the coal trains. Following the example of M. Verpilleux in 1843 on the Lyons and St. Etienne line in France, he decided to make use of the unprofitable weight of the tender, and so converted an old tender by fitting it with cylinders and motion. The tender thus became as it were an additional locomotive, supplied with steam from the boiler of the locomotive proper.

Further experiments having proved satisfactory, several 0–6–0 engines were provided in 1865-6 with steam tenders, these having their six wheels coupled by side rods outside the frames. Larger fire-boxes than those on the ordinary engines of the type were fitted, to allow for the steam consumption of the tenders. The latter had inside cylinders with a bore and stroke of 12 in. by 17 in., the wheels being 4 ft. in diameter in some cases and 4 ft. 6 in. in others. The cylinders drove on the centre axle, which was cranked. Steam was supplied to the tender cylinders from a double regulator through a long pipe, and the exhaust passed to a condenser in the tender tank, thus heating the feed water. These engines were capable of hauling trains some 25 per cent. heavier than did the ordinary engines, but the coal consumption was about 12 per cent. more per unit load. Many of the sidings of that time were unable to accommodate the full wagon load of the steam-tender engines, however, so that as a result of the delays so caused the loads were reduced and the necessity for the special tenders vanished.

There were also other difficulties. "Mechanically the steam tenders worked very well," Mr. Sturrock once wrote, but "some of our drivers don't like working what they call two engines and only getting paid for one." The men certainly had some cause for complaint, for when the water in the tender became warmed up after running some distance, the exhaust steam would not condense. Thus clouds of steam blew out from the tender and rendered the position of the men on the footplate decidedly uncomfortable owing to the heat.

The former Manchester, Sheffield and Lincolnshire Railway also tried six of these tenders, and the Eastern Railway of France built two of them, which later were converted to shunting locomotives by the addition of boilers to the frames.

After this scheme was abandoned normal methods held good for many years as far as this country was concerned, and steam tenders as such passed into history. In order to secure extra power various articulated designs have been evolved, and certain compound locomotives have been arranged so that boiler steam is used direct in the low-pressure as well as the high-pressure cylinders for starting the train from rest, suitable valves enabling the engine to commence working compound when once the train is well in hand. The Worsdell two-cylinder compounds on the Great Eastern and North Eastern railways had a change valve of this kind. The well-known Midland compounds of the L.M.S.R. actually start to work as powerful two-cylinder simple engines, boiler steam being admitted to the low-pressure cylinders, and the high-pressure piston merely "floating" in its cylinder with steam on each side of it. As the regulator handle is moved back across its quadrant to increase its opening, the change to fully compound working takes place, the inside high-pressure cylinder receiving boiler steam and then exhausting into the two low-pressure cylinders outside.

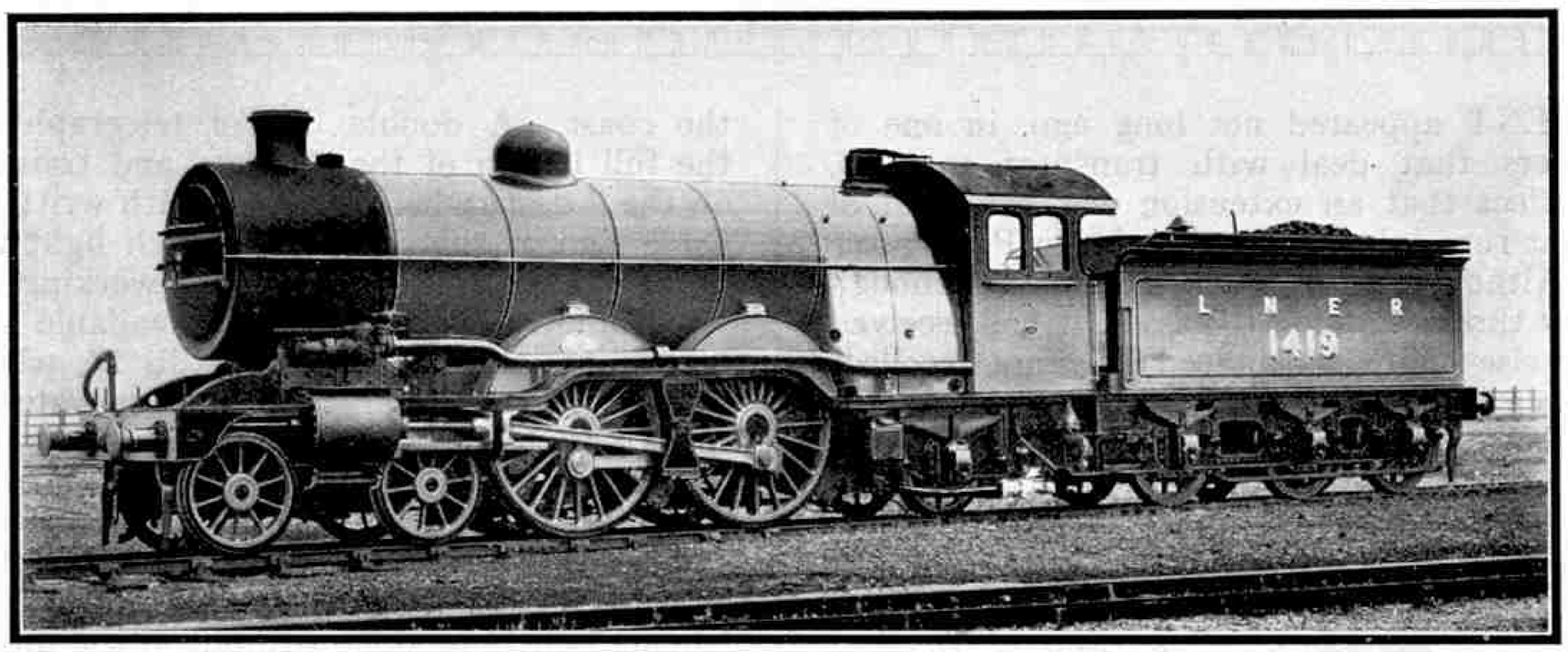
Considerable attention has been given recently to the "traction increaser," or booster as it is more generally termed. This takes the form of a small steam engine driving by means of gearing a normally idle pair of wheels, being capable of being cut in or out as required by the circumstances of the moment. This scheme was first put into practice in America, and many locomotives are running in that country fitted with boosters, some even having a tender bogie booster-driven.

There are on practically every railway many locomotives that have become rather outclassed by increasing demands of traffic, and to which any increase of power, apart from the boiler, would be a valuable addition. Special attention in this country was directed to this idea by the appearance in 1923 of an "Atlantic" locomotive of the G.N. type in rebuilt form, with the trailing wheels under the wide fire-box driven by a booster engine with two cylinders. The locomotive concerned was No. 1419 of the large-boilered 4–4–2 type that has such a reputation for notable work, hauling loads, especially during the War period and prior to the introduction of the "Pacifics," that would hardly be thought possible for engines with only 36 tons adhesion weight and a tractive effort of 17,300 lb. At the same time the starting from rest of

such loads by these locomotives often proved difficult, especially up the gradients of 1 in 105 to 110 out of King's Cross, through tunnels where slipping is a menace owing to greasy rails.

This was a suitable opportunity for the effective use of an auxiliary such as the booster, which could be dispensed with once the train had been accelerated to its normal pace and gradient conditions were more favourable. The engines are capable enough on reasonable grades, and have ample steaming power with their large boilers and wide fire-boxes, so that the use of a booster engine could hardly occasion any anxiety as to the supply of steam.

One of the Franklin Supply Company's booster engines was fitted to the trailing axle of No. 1419, and at the same time opportunity was taken to provide the double-window cab of the "Pacific" pattern, instead of the somewhat abridged form of shelter favoured by Mr. Ivatt, and developed from the severe "Stirling" cab. Trials were carried out over heavy gradients with a train of 18 coaches, and the advantage of the booster was at once apparent. The tractive effort available was in fact increased by an additional 8,500 lb. with the booster in operation. The idler pinion, by means of which the booster is put in and out of gear with the trailing wheels, is power-actuated, an air compressor being mounted at the side of the smoke-box for the purpose. Other external differences, apart from the new cab, are the steam and exhaust pipes running along the platform of the engine from the smoke-box saddle to the cab. These are plainly shown in the accompanying illustration of No. 1419, which now bears the number 4419.



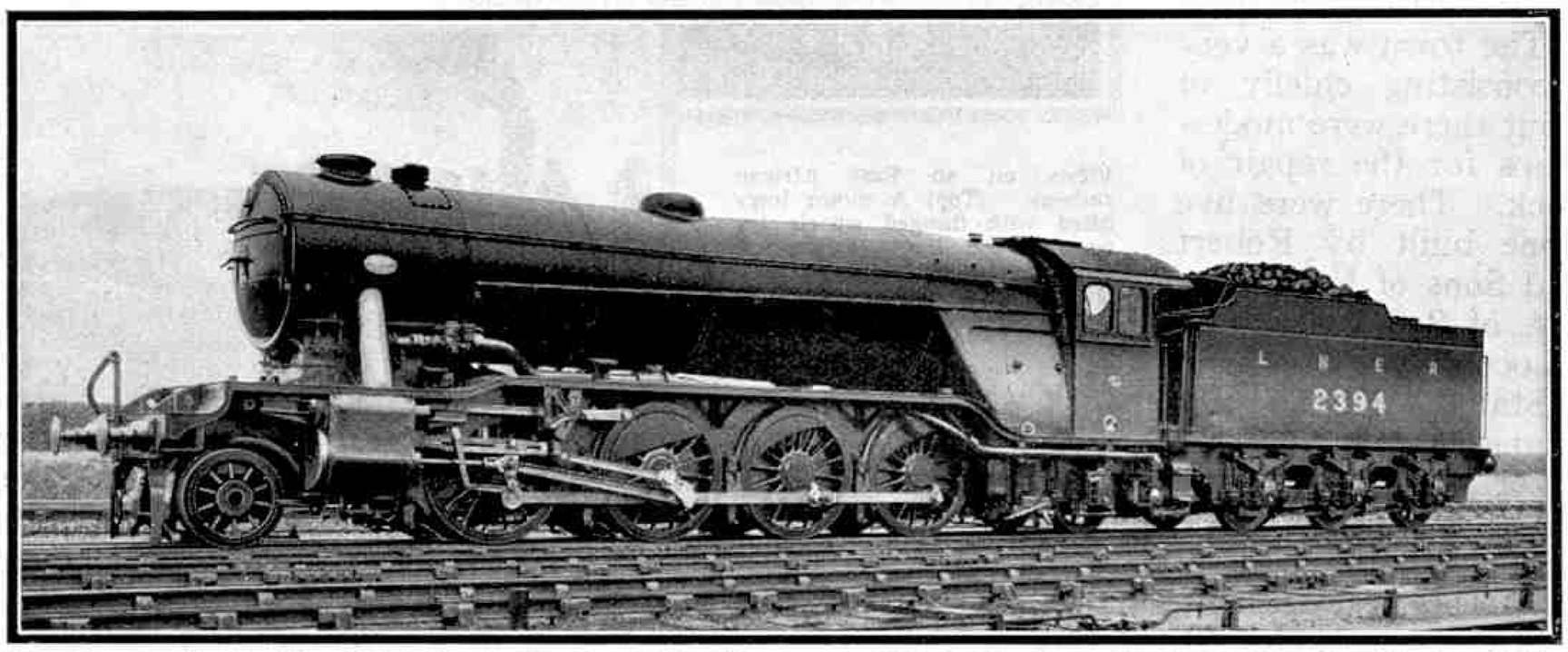
The first locomotive in Great Britain to be fitted with a booster. This is now L.N.E.R. No. 4419, and is one of the well-known large-boilered "Atlantics" introduced on the G.N.R. by Mr. H. A. Ivatt.

It was found that certain modifications were necessary, however, as the booster wheels were inclined to slip under full steam, and the engagement of the gears when running at low speeds gave some trouble. In addition, as the booster exhaust and the main exhaust were discharged through a combined blast pipe, the booster exhaust tended to choke the main exhaust and lower the boiler pressure. The gear ratio of the booster engine was altered, and although the nominal tractive effort suffered, the effects were beneficial, for the tendency to back pressure was reduced by the booster working more slowly. The blast pipe was modified, and the results obtained were more satisfactory. The total tractive effort available became 22,340 lb., but the alteration resulted in the locomotive being capable of starting and re-starting a load of 535 tons on a gradient of 1 in 100, and on a long bank of 1 in 96 a load of 350 tons could be handled.

A further development, again on the L.N.E.R., was seen in 1925, when the two "Mikado" 2–8–2 goods engines appeared. These were intended for coal and mineral traffic just as the old steam tender locomotives had been; and apart from their unique position as the only 2–8–2 tender engines in Great Britain, they are notable for having three cylinders and similar boilers to the "Pacifics." Booster gear is provided to the trailing axle, and the tractive effort rises from 38,500 to 47,000 lb. with it in operation. Although they have been successful for the services for which they were designed dealing with 1,600-ton trains of 100 wagons, no further engines of this pattern have yet appeared, probably as a result of the decline in freights during recent years. The remarkable high-pressure locomotive No. 10000 is also provided with booster gear, but its unusual character in so many other directions has prevented this feature from attracting much attention.

The latest development on the L.N.E.R. is noteworthy. This group is the only one that uses "Atlantic" engines to any great extent, and ever since the first booster installation in 1923, locomotive enthusiasts have been eagerly awaiting the appearance of an N.B., N.E., or G.C. "Atlantic" similarly fitted. Mr. Gresley has provided yet another locomotive novelty. He has long favoured the method of articulating coaches, and he has now applied this principle to the locomotive and tender, so that the trailing wheels of the former and the leading wheels of the latter are combined in a bogie truck. In addition the leading axle of the bogie is booster driven, the apparatus being supplied by J. Stone & Co. Ltd., of Deptford.

So far two engines have been dealt with, No. 727 illustrated here, and No. 2171 of the former North Eastern three-cylinder class "Z," but now "C7" in L.N.E.R. lists. The rear end of the tender, which is of the high, flat-sided variety developed recently, is carried on another four-wheeled bogie, the water pick-up scoop being arranged in front of this. Considerable modification of the engines themselves have been carried out, and they have been made to conform externally as far as possible with the standards set in the "Shires," "Sandringhams," and other classes. New boilers have been fitted with a pressure of 200 lb. against the 175 lb. pressure previously employed, and larger fire-boxes with sloping backplates are incorporated.



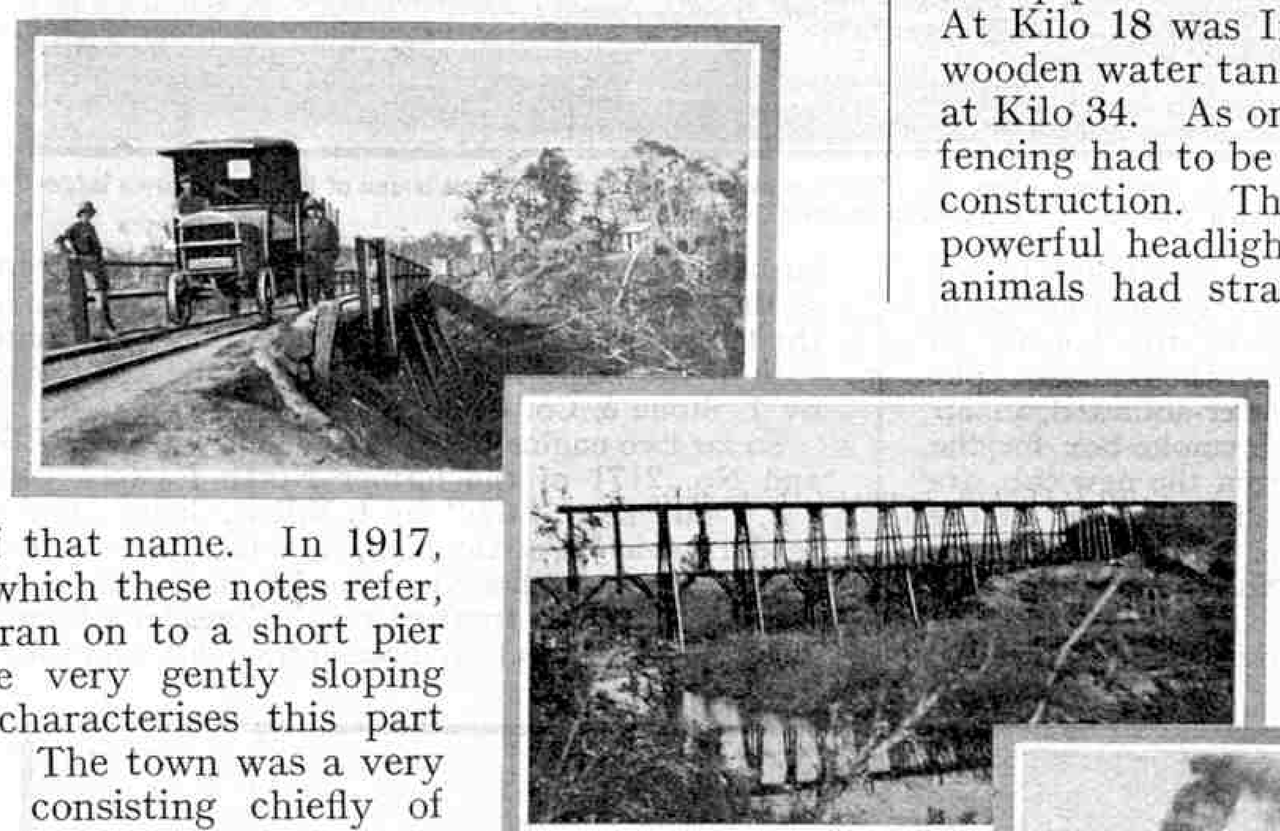
Boosters are fitted to this and its sister engine No. 2393. They were built in 1925, and can haul 1,600-ton mineral trains of 100 wagons. They are the only "Mikado" or 2-8-2 tender engines in this country.

The appearance of the rebuilt engines is striking, and equally so are their capabilities as shown in trials. Without the booster eight minutes were required by No. 727 to attain 18 m.p.h. from the start with a 300-ton load up a 1 in 70 gradient. With the booster in operation $5\frac{3}{4}$ minutes only were required up the same gradient to reach a speed of 25 m.p.h. On the level track it was found that a train of 496 tons could be started from rest without the booster, but with its aid a load of 746 tons could be dealt with under the same conditions. The total weight of the engine and tender has been increased by $10\frac{1}{4}$ tons by the rebuilding, but the tractive effort of the engines has risen from 19,300 lb. in their original state to 22,012 lb. as rebuilt, or 27,012 lb. with the booster in operation. As "Pacific" engines have displaced the "Atlantics" from the heaviest duties, the result of this experiment and the possibility of its extension to include other engines will be watched with great interest.

A Little-known Railway in Portuguese East Africa

By R. D. Gauld, M.Eng., A.M.Inst.C.E.

A STATEMENT appeared not long ago, in one of the papers that deal with transport matters, to the effect that an extension was proposed of the railway that runs inland from Lumbo in Portuguese East Africa. Although this railway is important enough to the territory through which it passes, it has received little publicity elsewhere, and indeed I cannot recollect ever having seen any account of it. As I had some experience of this railway during the War, the following notes, which were collected at the time, may be of interest.



Views on an East African railway. (Top) A motor lorry fitted with flanged wheels for use on the line. (Centre) A temporary timber viaduct. (Right) One of four Baldwin 2-6-2 locomotives.

Lumbo is on the coast, opposite the town of Mozambique on the island of that name. In 1917, the year to which these notes refer, the railway ran on to a short pier built on the very gently sloping beach that characterises this part of the coast. The town was a very small place, consisting chiefly of native huts; but there were moderately good shops for the repair of the rolling stock. There were five locomotives, one built by Robert Stephenson and Sons of Newcastle, and the others, of 2–6–2 type, by the Baldwin Locomotive Company of the United States. All the rolling stock was marked "C.F.M.," standing for "Caminho de Ferro de Mozambique," or Mozambique Railway. Engines were reversed at Lumbo by means of a triangle. I made my first journey over the line in a Napier lorry fitted with flanged wheels. This was turned by jacking it up in the middle until the wheels cleared the rails.

The line, which is laid to the 3 ft. 6 in. gauge, runs for about 38 miles to the inland terminus at Monapo. Rails were being landed for a 50-kilometre extension, and were stamped "Illinois, U.S.A." The rails in the track, some of which were stamped "Krupp, 1914," were about 30 ft. in length and were carried on timber and steel sleepers laid alternately. The line was well drained, but poorly ballasted, a great deal of the ballast being red sand banked up to the rails on the outside. The platelaying also appeared to be poor, for the track was very much kinked. There were no gradient boards and very few kilometre posts. The grades seemed to be switchback, but with a decided rise inland, and towards Monapo granite appeared in place of the red soil near the coast. A double line of telegraph wire extended the full length of the railway, and trains were worked on the "despatcher" system, with written train orders. On a line of this kind, with such light traffic, there is no need for signals or for block working.

Locomotive water was not available at Lumbo, the first water station being at Kilo 12, where the engine backed down a siding to a tank for water pumped from the river. A start had been made with the laying of a pipeline from this place along the track to Lumbo. At Kilo 18 was Ingema Station, with a tin shed and a wooden water tank; and there was a fairly good station at Kilo 34. As on all railways in undeveloped countries, fencing had to be done without in the interests of cheap construction. The locomotives were provided with powerful headlights to help the driver to see whether animals had strayed on to the line. They also had cowcatchers to throw off the line any animal that might be unlucky enough to be run down.

The most important engineering feature on the line was the large viaduct at Kilo 42, about two miles from Monapo. This was really only a temporary structure, pending the receipt of steelwork for a permanent viaduct. It was built in the short time of three months by three Portuguese whites and a gang of natives. The timber was all round stuff, cut locally, and there were diagonal ties made from rails. Each trestle had a concrete footing, and the whole job was a highly creditable piece of work. The deck was timbered in such a manner as to permit of road vehicles crossing it. Apparently the temporary structure was considered so satisfactory by the authorities that they were in no hurry to build the more permanent structure originally intended for this site.

The reversing triangle was situated close by, and also a water tank, water being pumped from the river. No water appeared to be available at the terminal Monapo, but the engine tenders were replenished there with wood fuel. The line would appear to have been too short to attract much traffic, but the extension should help to bring business to it. Improved pier accommodation at Lumbo probably will be necessary to reach deep water at all states of the tide.

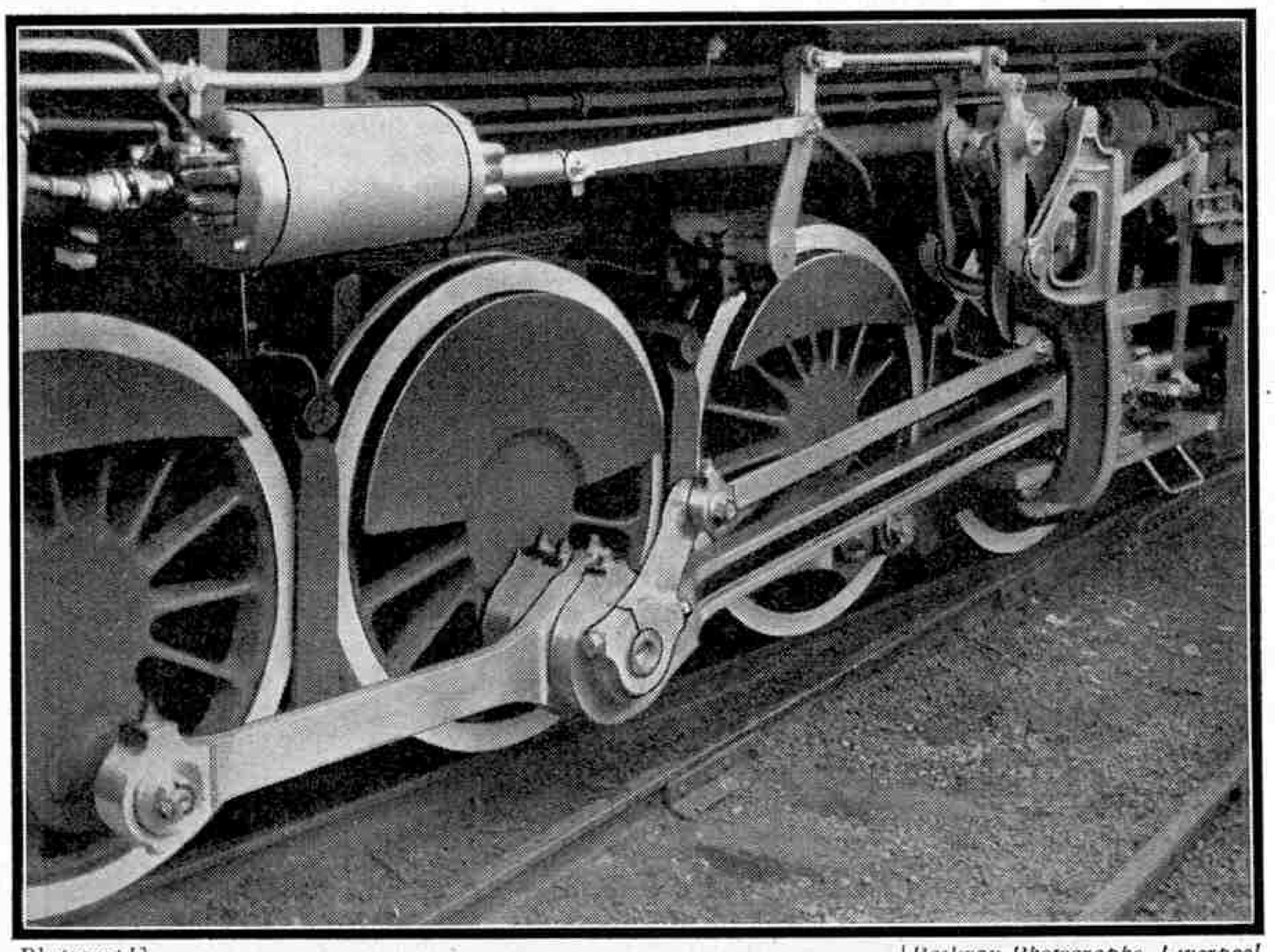
The Lima Drive for Locomotives

Relieving Stress on the Main Crank Pin

THE increasing use of steam at high pressure, and the introduction of large cylinders, particularly in America, where the loading gauge does not restrict dimensions to so great an extent as in this country, has led to an increase in the size of the various revolving and reciprocating parts of locomotives. The object of this has been to make these parts capable of standing up to their work, and of transmitting to the wheels in an efficient manner the power developed in the cylinders. The increased size of these parts has naturally resulted in an increase in weight. This has been counteracted to some extent by manufacturing the parts of special light alloy steels, as is the case on the well-known Gresley "Pacific" locomotives of the L.N.E.R., and the "Lord Nelson" locomotives of the S.R. The weight may be kept down also by making the axles and crank pins hollow. The axles of the coupled wheels on the G.W.R. "King" locomotives are hollow, and many years ago hollow crank pins were fitted to balanced crank axles on the old L.S.W.R. by the late Mr. D. Drummond, when he was in charge of the Locomotive Department.

Of the various moving parts, the "big end" of the connecting rod is usually very massive, and necessarily so; for here the thrust of the pistons is transmitted to the crank pins, and the reciprocating motion of the former is converted to the rotating motion of the latter. Ample bearing surfaces are necessary in order that the bearing pressure shall not be excessive; and this involves the use of large bushes, or "brasses" as they are called; and of course also of large crank pins. There is considerable stress on the main crank pin of an outside cylinder locomotive, for not only has the massive big end of the connecting rod to be accommodated, but also allowance has to be made for the coupling rod. There is therefore a danger of distortion of the pin where large cylinders with correspondingly powerful thrust are employed, for the connecting rod is usually fitted outside the coupling rod, although there are exceptions to this.

In order to avoid possible distortion and excessive stress on the main crank pin, the Lima Locomotive Works of America have evolved what is known as the "Lima Drive." The accompanying photograph shows this drive applied to a powerful 2–8–4 locomotive. The rear coupling rod fits between the jaws of the main or connecting rod big end, which is forked to receive it. On the inside of the inner jaw the intermediate coupling rod will be found connecting the second and the third coupled axles. A heavy steel bush is forced into the forked end of the connecting rod, and this provides a bearing for the coupling rods. Inside this bush is a floating bush of bronze, which serves as a bearing on the main crank pin. In this manner the thrust of the pistons is directly transmitted to the other coupled wheels, thus relieving the main crank pin of a great deal of stress.



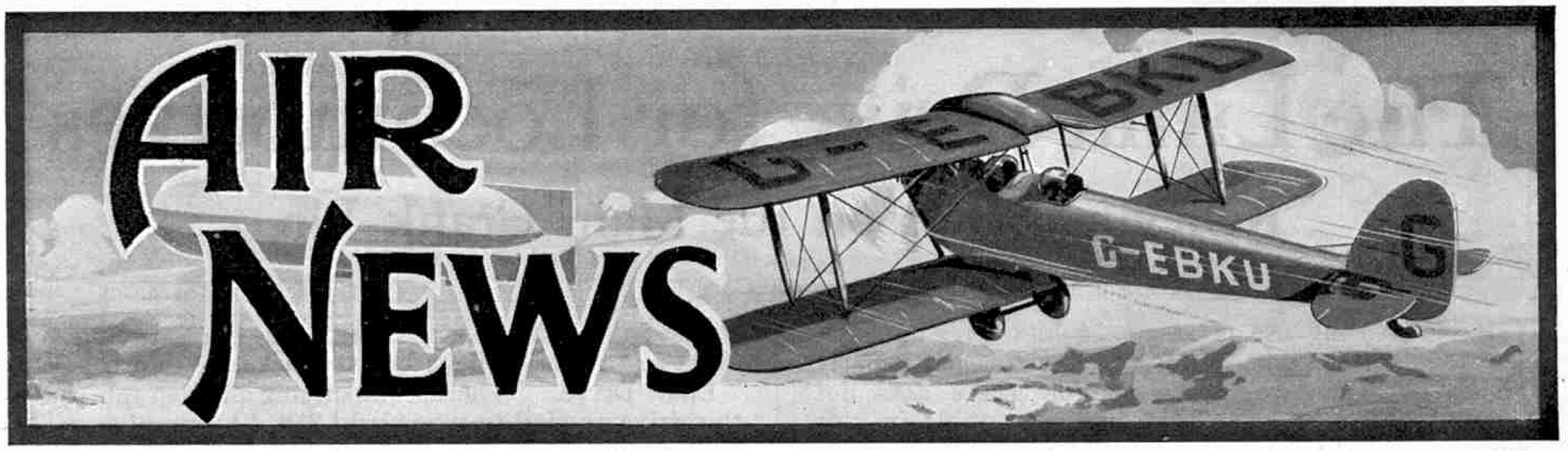
Photograph [*Railway Photographs, Liverpool*

A view of the rods and motion of a giant American 2-8-4 locomotive, showing the application of the "Lima" drive. The forked big end of the connecting rod is plainly visible with the rear coupling rod between the jaws.

Baker valve motion, which does away with the necessity for an expansion link, is used on this locomotive. This valve gear is widely applied in present-day American locomotive practice. The cylinder of the power reverse gear is clearly visible above the driving wheels.

It is of particular interest to note that the L.N.E.R. locomotives of the "Shire" class are provided with a drive similar to the Lima, the coupling rod fitting between the jaws of the forked connecting rod. Both rods are fitted over a steel bush, which in turn fits over a floating brass bush. The latter bush is carried on the main crank pin, which is free to revolve inside it.

The 2–8–4 locomotive to which the Lima drive is shown attached in our illustration, is one designed and built by the Lima Locomotive Works for service on the Boston and Albany Railroad. A notable feature is the large grate area provided; and the steam pressure is 240 lb. per sq. in. The four-wheeled booster-fitted trailing truck is interesting, as it is articulated to the main frame in a similar manner to that used on "Mallet" locomotives, and is pivoted at a point in front of the fire-box. There is no extension of the main frames under the fire-box, and the buffing and pulling stresses are therefore taken by the truck frames.



A High Speed British Mail Aeroplane

An order has been placed by the British Air Ministry for the construction of an aeroplane capable of speeds of 200 m.p.h. when carrying mail weighing half a ton. The machine is to be built by Boulton & Paul Ltd., Norwich, and will be an all-metal biplane designed on similar lines to those of the Boulton and Paul "Sidestrand," a twin-engined day bomber that was described and illustrated on page 796 of our issue for October last year.

The new mail aeroplane will be required to fly at high altitudes, and will be provided with navigational equipment that will enable it to be used safely at night. It was originally intended that the machine should be fitted with fully supercharged engines, giving it a maximum speed of more than 200 m.p.h., but now it has been decided that moderately supercharged Bristol "Pegasus" radial engines are to be employed. These will give the machine a cruising speed of more than 150 m.p.h. and a maximum speed in level flight of about 200 m.p.h. The machine will fly easily with full load when one engine is out of action, and its range will be at least 1,000 miles. Special devices will be provided to enable the mails to be picked up and dropped while the aeroplane is in flight.

Construction and preliminary tests are expected to take about 12 months. The machine then will be put through drastic tests on certain Empire air routes, and if these prove successful a change may be made in the present air transport policy of the Air Ministry. Mails then will be carried in machines of this type instead of in aeroplanes that are used for the transport of passengers, for these need time for rest; and letters and parcels can be carried more swiftly in special aircraft than in liners catering for the comfort of travellers.

Diving at 410 m.p.h.

During diving tests with fighting machines, speeds of nearly 410 m.p.h. have been attained. When a Fairey "Firefly" recently was dived from a height of 20,000 ft. to one of 9,000 ft., the airscrew was turned by the rush of air at a higher speed than with the engine running.

"Heracles" Air Liners of Imperial Airways

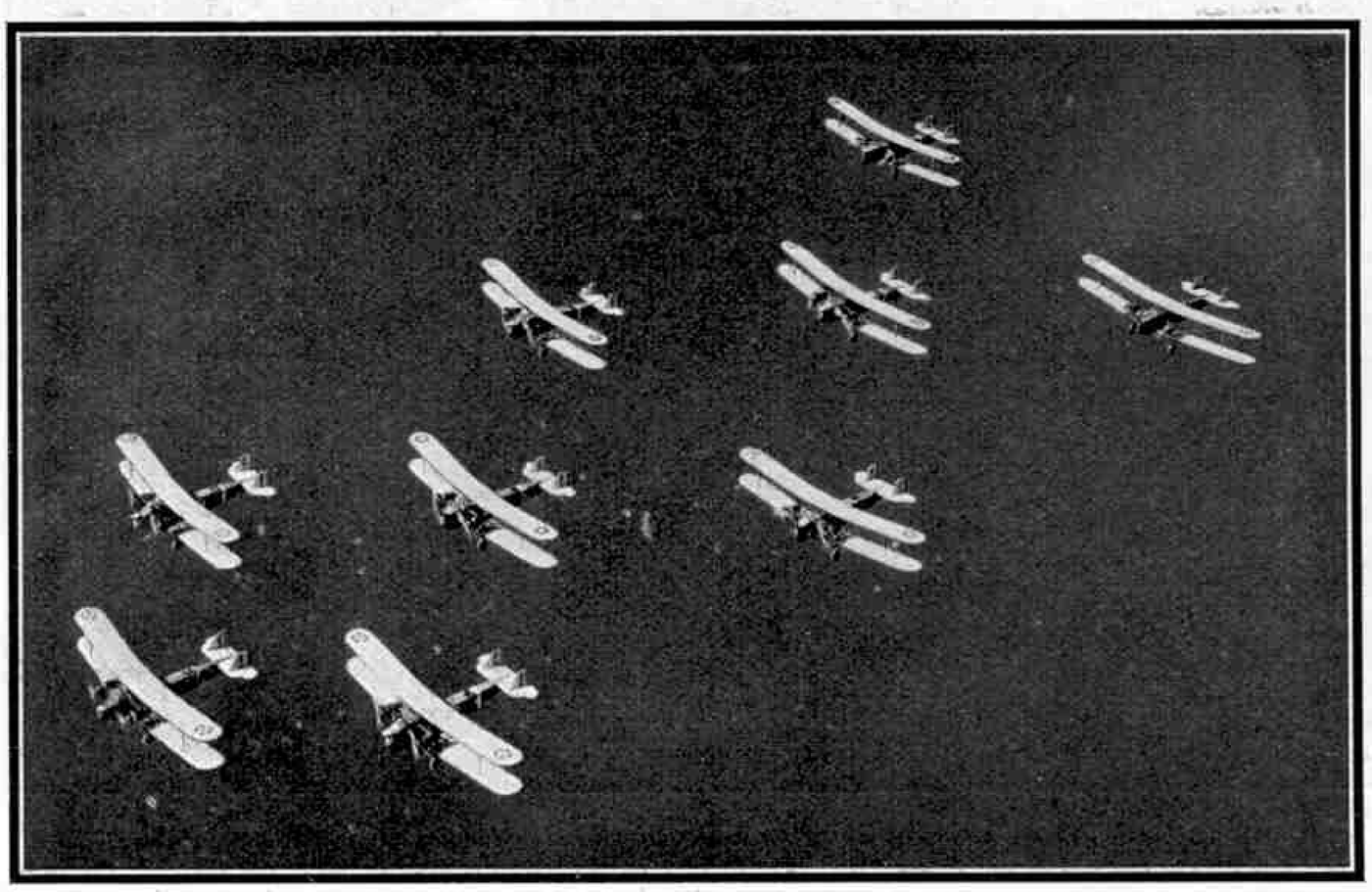
The last of the eight 4-engined Handley Page "Heracles" air liners for Imperial Airways Limited now has been delivered. Four of these machines, named "*Hannibal*," "*Hanno*," "*Hadrian*" and "*Horsa*" respectively, are used on the Cairo-Karachi section of the Indian air mail route, while "*Hercules*," "*Horatius*," "*Hengist*" and "*Helena*," the remaining machines, are employed on the London-Paris service.

The new Handley Page liners were fully described and illustrated on page 308 of the "*M.M.*" for April, 1931, and it will be recalled that they are of two types. Those employed on the Cairo-Karachi service are known as the "Eastern" type and have accommodation for 18 passengers in addition to 3,500 lb. of mails and freight. The machines on the service between London and Paris are capable of seating no less than 38 passengers, but their cargo carrying capacity is only 1,000 lb.

Each of these giant liners carries a pilot, an assistant pilot and a wireless operator. In addition, two stewards are employed in the machines on the London-Paris services, in which a four-course lunch is served while the machine is in full flight, but only one steward is required in the liners used on the Cairo-Karachi route.

* * * *

This year the King's Cup Air Race, which is to be held on 8th and 9th July, will start and finish at Brooklands.



A group of bombing aircraft flying over the sea in attack formation. This official photograph is reproduced by permission of the U.S. Army Air Corps.

Airport Runways Nearly a Mile in Length

An airport that will be one of the finest in the world is now being constructed on the south shore of Lake Pontchartrain, near New Orleans. It will have an area of 310 acres, and its cost is expected to be about £400,000. Five years will be occupied in the work of construction.

The airport is to be built on ground reclaimed from the Lake. A concrete bulkhead or dam is now being constructed to enclose a triangular area with its base on the shore and its apex projecting outward. Thus the airport will have water on two sides and land on the third, and therefore will be suitable for landplanes, seaplanes and flying boats. Four runways, each of which will be 300 ft. in width, are to be provided. One of these will be 4,000 ft. in length, and the others 3,800 ft., 3,700 ft. and 3,600 ft. in length respectively. Each of the two longest runways will be parallel to a side of the triangular area, while the shorter ones will form a cross near its base.

When the airport is fully developed, it will include hotels, club houses and shops, together with a car park having a capacity of 3,740 motor cars. Only part of the work is now being carried out, however, and this section will be completed in about 14 months. It includes the construction of three administrative buildings, a four-storey control tower, two hangars and maintenance and repair sheds, and concrete runways and the lighting equipment necessary for night flying are to be provided to meet immediate needs.

Aeroplane Driven by Steam Engine

An American inventor has constructed an aeroplane in which a light steam-driven power plant is employed instead of an internal combustion engine. Steam is raised by burning crude oil, and the claim is made that a machine fitted with the new engine is capable of remaining in the air more than 30 days without refuelling!

It is said that successful ground tests have been made, and the inventor is confident that the machine will show to equal advantage in actual flight.

A Canadian Flying Boat

Flying boats and amphibians are particularly suitable for use in Canada, in many parts of which rivers and lakes abound, and the machine shown in the upper illustration on this page has been designed for service in that country. It is the Canadian Vickers "Vedette" three-seater flying boat, the amphibian form of which is illustrated. The machine is specially designed for forest fire detection and photographic survey work, and the Mark VI, its most recent form, has a steel hull and stainless steel fittings throughout. It is very stable and may be flown for long periods with hands off the controls.

The Canadian Vickers "Vedette VI," an amphibian flying boat described on this page. For permission to reproduce this photograph we are indebted to the courtesy of Vickers (Aviation) Ltd.

The "Vedette" is a single-bay biplane with a span of 42 ft. 2 in. and a length of 32 ft. 11 in. It weighs 2,700 lb. when empty and has a fully loaded weight of 4,000 lb. The machine is fitted with a 300 h.p. Wright "Whirlwind" air-cooled radial engine, and its maximum speed is 110 m.p.h. while its cruising and landing speeds are 90 m.p.h. and 60 m.p.h. respectively. It climbs from the ground at the rate of 600 ft. per minute and has a service ceiling of 1,400 ft. The fuel tanks fitted to the machine enable it to cruise for 4½ hrs. and during this time it is capable of covering about 500 miles.

Aircraft Propellers of Magnesium Alloy

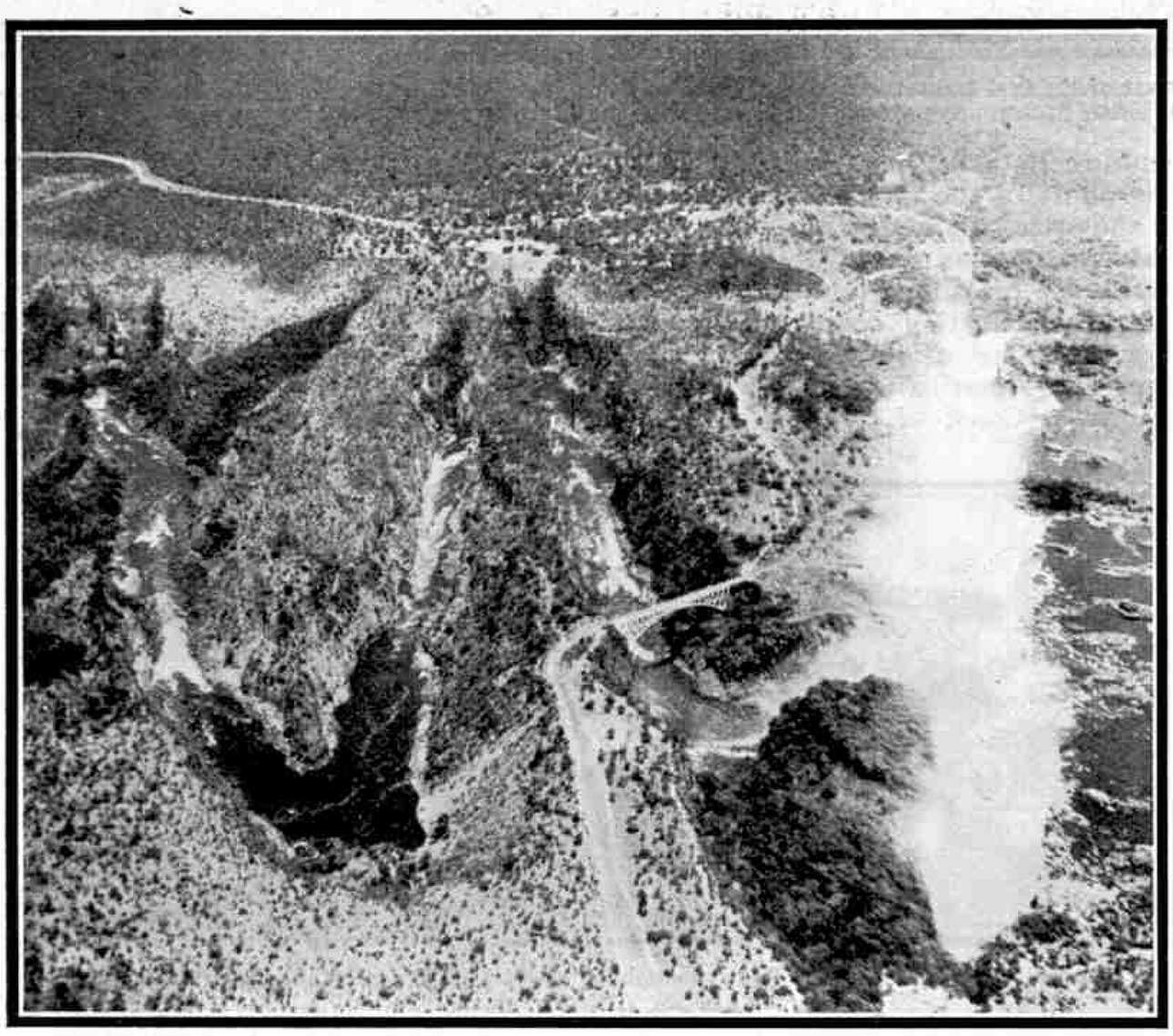
An interesting development in the manufacture of metal airscrews is the introduction of a magnesium alloy that is suitable for this purpose. The alloy has been produced as the result of four years' research by the Bristol Aeroplane Co. Ltd. It is capable of hard wear, but is very much lighter than the aluminium alloys now used by airscrew manufacturers.

Although metal airscrews are more expensive than those made of wood, they are much more durable, and a further advantage is that they can be repaired, while wooden ones that have met with accidents must be replaced. At present the cost of a metal airscrew is about five times that of a wooden one, but the use of the magnesium alloy that has been developed by the Bristol Aeroplane Co. Ltd. will reduce the price considerably.

Undercarriage Repaired During Flight

Mr. S. J. Blackmore, a New Zealand airman, recently hung head downward from his machine for more than an hour while carrying out repairs to his undercarriage. The need for this remarkable action came at the end of a cross-country flight with two passengers. The machine bumped rather heavily when an attempt to land was made, and a bolt on one of the landing wheels was broken. The pilot opened the throttle and again the machine rose into the air in order to avoid overturning.

Mr. Blackmore then decided to try to repair the damage by using a screwdriver as a temporary bolt. One of the passengers therefore took control of the machine, and the other let him down to the undercarriage by means of straps made from cloth. Although there was a severe rainstorm while the repair work was being carried out, it was successfully completed.



An aerial view of the arch bridge spanning the Zambesi River below the Victoria Falls, the spray from which may be seen on the right of the illustration.

New Bristol General Purpose Biplane

One of the most interesting of recent military aircraft is the Bristol 118. This is a general purpose high performance machine of the sesquiplane type, the upper and lower wings having spans of 40 ft. 8 in. and 28 ft. 8 in. respectively; and an unusual feature is the use of a tail wheel instead of the skid usual in British practice. The undercarriage is of the split axle type, thus enabling the machine to land without mishap on rough surfaces.

The new machine may be fitted with either a Bristol "Jupiter X.FA" or a Bristol "Pegasus" engine. With a "Jupiter" installed its speed at ground level is 140 m.p.h. The maximum speed of 165 m.p.h. is attained at an altitude of 12,000 ft., and at a height of 20,000 ft. the speed only drops to 151 m.p.h. This altitude is attained in 22.1 minutes. The absolute ceiling is 25,600 ft.

The Bristol 118 normally carries a crew of two and can be used for fighting, bombing, army co-operation, photography or ambulance work. When in use as an ambulance, the machine has accommodation for two invalids on stretchers. One of these is carried in the space at the bottom of the fuselage that is occupied by the observer when the machine is being used for bombing, and space for the second is provided at the top of the fuselage immediately behind the rear cockpit.

The Segrave Memorial Trophy

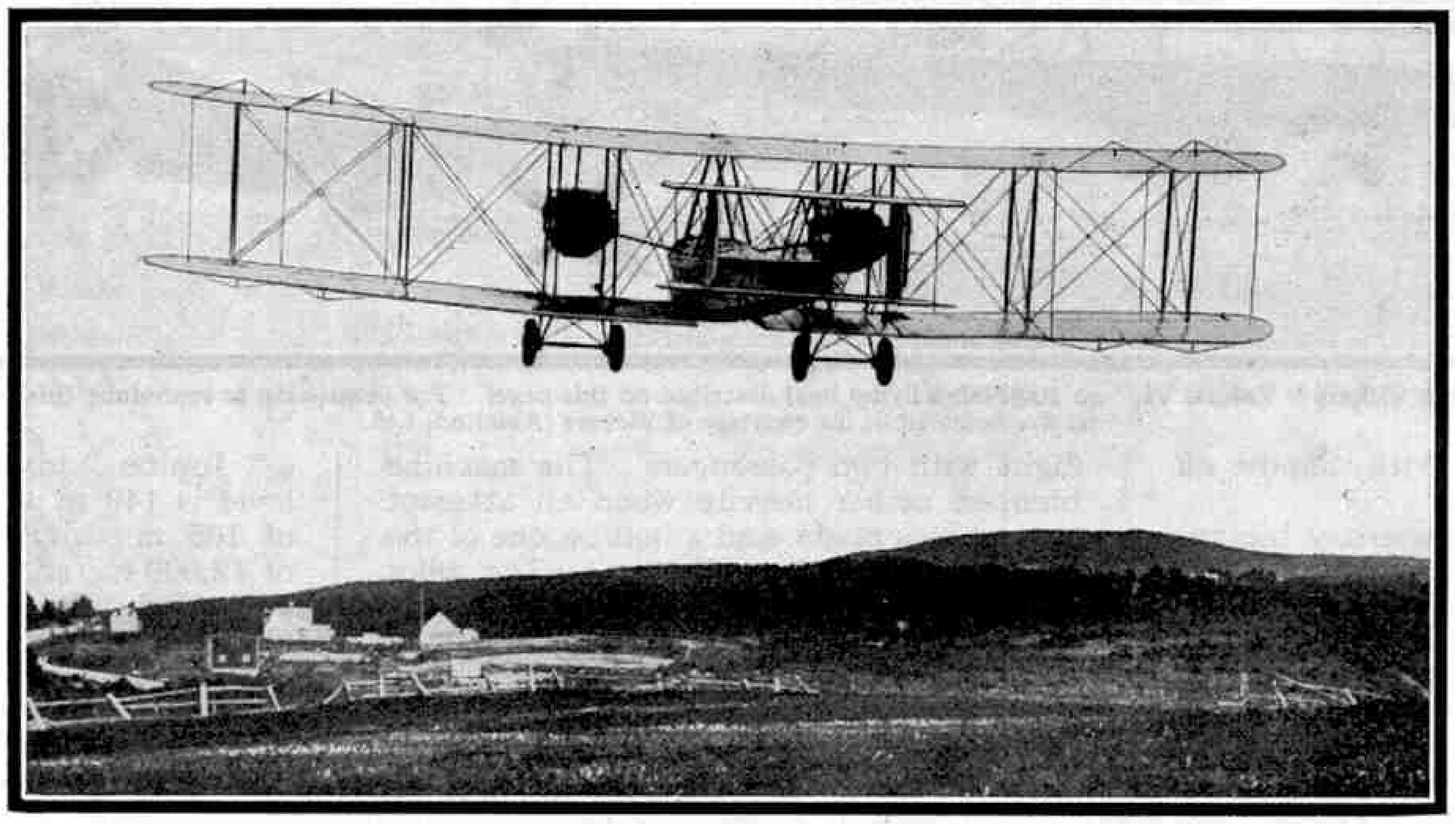
Squadron Leader Bert Hinkler has been awarded the Segrave Memorial Trophy for his recent flight in a de Havilland "Puss Moth" from New York to London, in the course of which he crossed the South Atlantic. During this flight Hinkler covered 10,560 miles in 104½ flying hours, an average of about 100 miles an hour.

The Segrave Trophy is a memorial of the late Sir Henry Segrave, and is awarded annually by a special Committee of the Royal Automobile Club to the British subject who, in the opinion of the Committee, accomplishes the most outstanding demonstration of the possibilities of transport. The last award was made to Air Commodore Kingsford Smith.

Crossing the Atlantic by Air

A Record of Famous Flights

THE flights of the Wright Brothers and other pioneers of aviation naturally were made over land, but those interested in the aeroplane quickly realised its value for crossing stretches of water without the necessity of changing the means of transport. The crossing of channels or streams that could not be bridged was calculated to impress the general public with the usefulness of aircraft, and the flight that perhaps did most to show that the aeroplane had come to stay was the first crossing of the English Channel by M. Louis Blériot in July, 1909. This flight was made after M. Hubert Latham, another famous pioneer, had failed in an effort to fly from France to England. Although the distance from coast to coast is only 21 miles, Blériot's success thrilled the whole world and gave the first indication of the great possibilities of air transport; but it is certain that at the time few people imagined that within ten years the Atlantic Ocean also would be crossed in an aeroplane with little more difficulty than that encountered by Blériot in crossing the Channel.



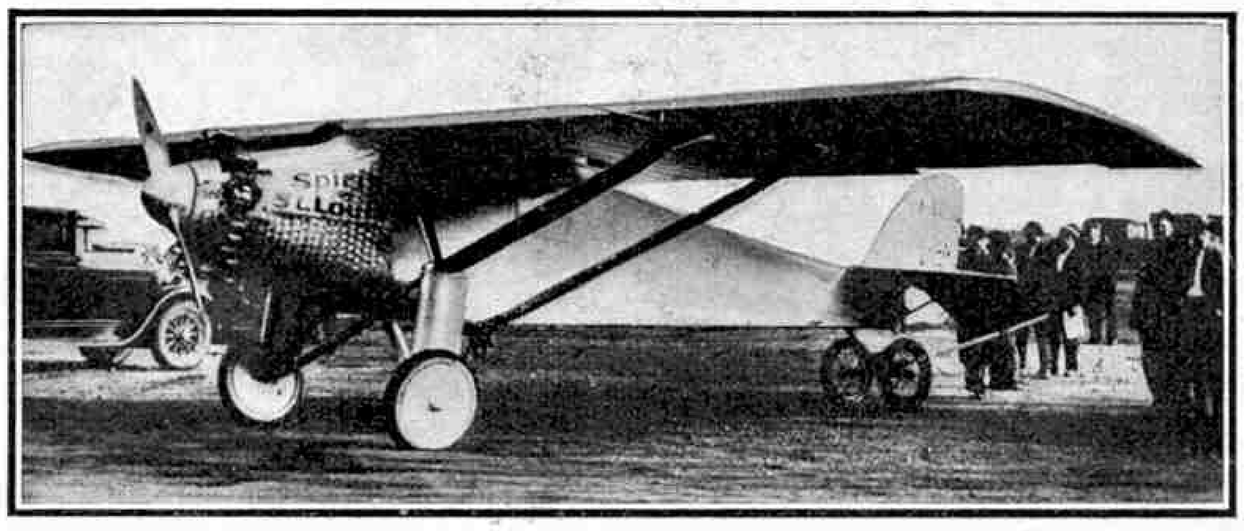
The start of the first transatlantic flight, made on 14th June, 1919, by Captain J. Alcock, and Lieutenant A. Whitten Brown. We are indebted to Rolls-Royce Ltd., for permission to reproduce this illustration.

The story of the conquest of the Atlantic by airmen may be said to have begun in 1915, when Lord Northcliffe offered a prize of £10,000 to the pilots of the first machine to be flown across it. In order to win the prize, a non-stop flight occupying no more than 72 hours had to be made, thus making it impossible to land on the Azores in order to reduce the difficulties of a journey over such a long distance. Apart from this condition, pilots attempting the flight were allowed choice of route, and as the shortest distance between Europe and America is the 1,890 miles between Newfoundland and the West Coast of Ireland, most of the early adventurers decided to follow this route.

No efforts were made to win Lord Northcliffe's prize until 1919, war activities occupying the energies of those whose training fitted them for the attempt. The first crossing of the Atlantic Ocean actually was begun on 16th May in that year by two American flying boats taking part in a flight round the world. These stopped at the Azores on the way, but the news that they were about to attempt the transatlantic flight hastened the preparations of several airmen who had already made their way to Newfoundland. These included H. Hawker and Lt. Commander K. M. Grieve, two British airmen who had determined to make the flight in a machine constructed by the Sopwith Aircraft Company. This was the "*Atlantic*," a biplane fitted with a 350 h.p. engine. The chief necessity in a machine intended for a long non-stop flight is large petrol storage capacity. The "*Atlantic*" had large tanks and was capable of rising with a load of nearly three tons. It was specially fitted with an undercarriage that could be dropped when the flight commenced in order to reduce dead weight, and the fuselage was so constructed that it could remain afloat for some time if forced down during flight.

On 18th May, two days after the American flight to the Azores, Hawker and Grieve took their places in their machine and began their flight. Nothing was heard of them for six days, and they had been given up for lost when news was flashed round the civilised world that they had reached the Hebrides in the "*Mary*," a small Danish steamer. It was then discovered that they had encountered thick fog in which neither skyline nor sea could be distinguished. Later engine trouble developed, making further flight impossible, but after a long and anxious search the "*Mary*" was sighted and the two men were taken on board. The vessel was slow and not equipped with wireless, and news of their rescue was not received until six days later.

Hawker's narrow escape did not prevent other attempts from being made, and only a month later the first non-stop flight from America to Europe was made by Captain J. Alcock and Lieutenant A. Whitten Brown. These airmen flew in a Vickers "Vimy" equipped with two Rolls-Royce engines, each developing 360 h.p. Their flight was commenced on 14th June. While over the ocean the two airmen often found themselves in hazardous situations, and on one occasion Lt. Brown actually left the cockpit in a vain effort to repair the wind motor that drove the generator of his wireless outfit. Eventually they sighted land, and the machine was brought to earth in an Irish bog 16 hrs. 12 min. after leaving Newfoundland. Although 13 years have elapsed since their flight, the time set up by Alcock and Brown has never been surpassed. The two men were knighted in recognition of their wonderful feat.



"The Spirit of St. Louis," the Ryan monoplane in which Lindbergh made the first solo crossing of the Atlantic Ocean.

The success of the flight of the British airmen in the Vickers "Vimy" put an end to further efforts to cross the Atlantic for eight years. In the meantime enormous strides were made in aeroplane design, and machines became speedier and more reliable on long non-stop flights. The possibility of further flights across the Atlantic then began to be discussed, and in the early months of 1927 preparations were made for several flights of this kind.

The airmen concerned were not content merely to fly from Newfoundland to Ireland, but aimed at making longer flights. The foremost of these was Captain Lindbergh, an American pilot who designed to fly alone from New York to Paris, a distance of 3,639 miles, in the "*Spirit of St. Louis*," a Ryan high-wing monoplane fitted with a 200 h.p. Wright "Whirlwind" engine. Lindbergh was regarded as foolhardy for attempting a flight of this kind alone, and his proposal earned for him the name of the "Flying Fool." He was thought to have little chance of

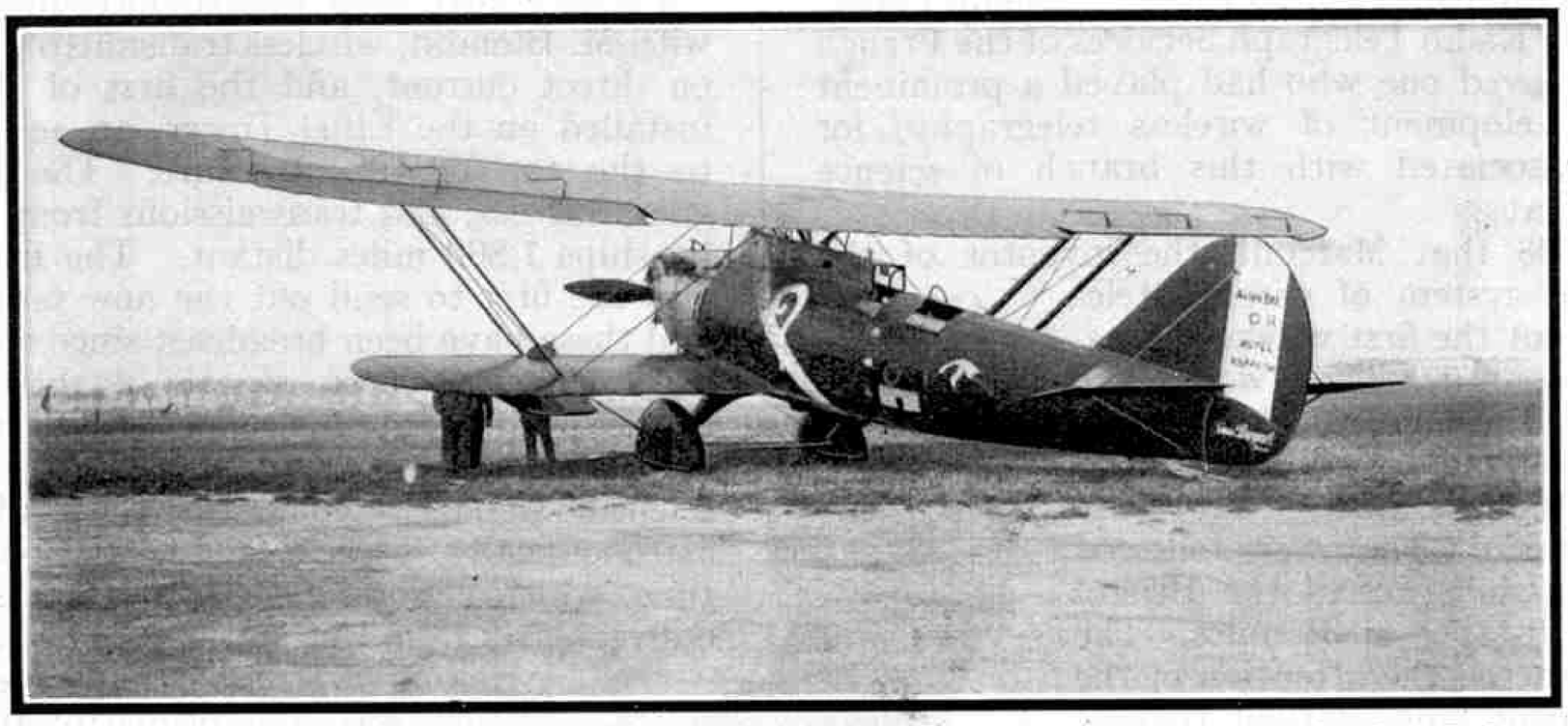
success, for he would have to fly for about 36 hours and the strain of being continually on the alert for this length of time was regarded as unendurable. He was an experienced pilot and an expert navigator, however, and had the most complete confidence in his ability to reach his objective. He waited patiently at Roosevelt Field, near New York, until at last he was told that the weather outlook over the North Atlantic Ocean was favourable. He then completed his preparations rapidly and set out on his great adventure. The result was a striking and almost sensational success, for although he was enveloped in clouds and darkness for long periods he flew swiftly and unerringly on the course he had planned, and alighted at the aerodrome at Le Bourget, Paris, 33½ hrs. after leaving New York. Lindbergh immediately became famous and his record since his transatlantic flight is a proof that his remarkable success was not due to mere chance.

The path blazed by the "*Spirit of St. Louis*" across the Atlantic Ocean was followed in 1927 by three other machines. The first of these was a high-wing monoplane named the "*Columbia*," piloted by Clarence Chamberlin, the American airman who made the first ship-to-shore flight from the liner "*Leviathan*." Accompanied by Mr. Levine as passenger, Chamberlin made for Berlin instead of Paris. He failed to reach the German capital owing to shortage of petrol, but covered a distance of about 3,920 miles before landing at Eisleben, 43 hours after leaving New York.

The next of the successful flights of 1927 was made by Admiral Byrd, then Commander Byrd, who in 1926 had flown from Spitsbergen to the North Pole and back. For his transatlantic flight he used a triple-engined Fokker monoplane named the "*America*," the crew numbering four. He left New York on 29th June, and almost immediately flew into thick fog. Similar conditions caused trouble during the greater part of the journey, and for many hours the airmen flew by instruments only. They crossed the French coast, but rain and mist made it impossible to land, and they decided to return to the coast in order to alight on the water as near the shore as possible. They came down without mishap, but water rushed into the cabin and the crew had difficulty in escaping. They rowed ashore in the small rubber boat carried in the machine, and then found that they had arrived at Ver Sur Mer, a small town in Normandy.

The fourth successful transatlantic flight of 1927 was less eventful than that of Byrd. It was carried out by Brock and Schlee, two American aviators, who on 27th October flew from Harbour Grace in Newfoundland to Croydon in a Stinson monoplane, "*The Pride of Detroit*"; the distance of 2,350 miles being covered in 34 hours. The airmen were engaged in a flight round the world, of which the transatlantic journey was only the first stage. They flew on as far as Tokio, but there were held up by bad weather and eventually abandoned the project.

While these flights were being made from west to east, efforts to fly from Europe to America also were being planned. This is far more arduous than flying in the opposite direction, for machines travelling westward are compelled to fly in the teeth of gales and storms, the prevailing winds over the North Atlantic being from west to east. The earliest efforts ended in failure, the machines and their occupants being completely lost after leaving Europe, and it was not until 12th April, 1928, that the crossing was accomplished. On that day Capt. Koehl and Baron Von Huenefeld, two German airmen, accompanied by Commandant Fitzmaurice, the chief of the Irish Air Force, left Ireland in a Junkers L.5 monoplane named the "*Bremen*." Strong head winds were encountered and the speed was low, with the result that a landing was not made until 37 hours after leaving Europe. The actual descent was made on Greenly Island, a bleak spot in the Gulf of St. Lawrence near Newfoundland.



The "Question Mark," the famous Breguet machine in which the French airmen Costes and Bellonte flew from Paris to New York in September, 1930. The airmen had flown from Paris to Manchuria in this machine in 1929, thus creating a long distance non-stop record of 4,911 miles that was not surpassed until last year.

Although flying in the eastward direction was less risky than crossing from east to west, the Atlantic Ocean also took toll of the lives of those who started from the American side. Navigation difficulties in storms and fogs probably accounted for the failures, and the importance of being able to keep on a correct course in these conditions was made clear during a remarkable flight carried out in 1928 in a seaplane by two American pilots named Stultz and Gordon. With them, in the "*Friendship*," as their machine was called, was Miss A. Earheart. Almost throughout their eastward flight they were unable to obtain a glimpse of the Sun or the stars, while they did not even see the ocean over which they were flying until they were nearly across. So successfully did the two pilots pursue their course with the aid of their instruments, however, that they scarcely deviated from their intended line, and eventually they alighted off the south coast of Wales.

Although the flights of 1927 and 1928 had shown that the Atlantic could be crossed, and no immediate practical results could be expected from repetitions of these flights, interest in transatlantic journeys by air continued throughout the following year. The Atlantic Ocean seemed to offer a challenge to the sporting spirits of airmen on both sides, and two flights of special interest were made, one by three French airmen, and the other by two Americans. The first of these flights was carried out by MM. Assolant, Lefevre and Lotti, who flew from Old Orchard, Maine, to northern Spain, a distance of 3,560 miles, in 28 hrs. 50 mins. After commencing their flight these airmen discovered a stowaway in their machine. This added seriously to the risk of the venture, for in long-distance flights of this kind weight must be very closely calculated and everything not absolutely necessary must be left behind in order to conserve petrol. The second of the two flights also was made from Old Orchard to Northern Spain, Capt. Vancy and Williams, the pilots concerned, occupying 31 hrs. 45 mins. in the journey.

Another view of the "Question Mark." The mark from which the machine derives its name is painted on the side of the fuselage.

In the meantime the "*Graf Zeppelin*" had attracted attention by making two return flights from Friedrichshafen, Lake Constance, to New York. The first of these was made in 1928 and the second in 1929. Thus the great airship crossed the Atlantic four times, and shortly afterwards made a fifth transatlantic journey as part of her famous voyage round the world. These were not the first airship flights across the Atlantic Ocean, for as early as July, 1919, Major Scott had piloted

(*Continued on page 281*)

A Pioneer of Military Wireless

The Career of General Ferrié

THE death on the 16th February last of General Ferrié, Chief of the Radio Telegraph Services of the French Army, removed one who had played a prominent part in the development of wireless telegraphy, for he had been associated with this branch of science since its early days.

It was in 1896 that Marconi, the inventor of the earliest practical system of wireless telegraphy, carried out the first wireless transmissions in this country. These were made from a room in the General Post Office, London, to a receiving apparatus installed on a roof over 100 yds. distant, and were completely successful. They were followed later by transmissions across the Bristol Channel over a distance of 3½ miles. The experiments attracted the attention of the Italian Government, and at their request Marconi carried out tests between a transmitter erected on the eastern side of the Gulf of Spezia and a receiver placed on board a tug-boat moored at various distances from the shore. Later other tests were carried out in this country over increasingly greater distances.

The late General Ferrié, who was Chief of the Radio Telegraph Services of the French Army.

The French Government took a keen interest in these experiments, and in March, 1899, Marconi attempted for their benefit to carry out wireless transmissions between England and France. The experiments were carried out between the South Foreland Lighthouse and Wimereux, a village on the French coast two miles north of Boulogne, and were quite successful. Transmissions were made from both sides of the Channel, and on the English side the experiments were witnessed by Marconi, and by the French Military and Naval Attaches in this country. The French Government was represented by Captain Ferrié, of the Engineers branch of the French Army. Captain Ferrié had become keenly interested in ordinary telegraphy during 1893, and it was natural that when wireless telegraphy was invented his interest should xtend to this new branch of the science. On his return to France he was asked by the Minister of War if this new method of communication could be developed and used especially for military purposes, and he enthusiastically assured the Minister that it could.

Shortly afterward Captain Ferrié was promoted to the rank of Commandant. In spite of his increased responsibilities he maintained his interest in wireless telegraphy, and in collaboration with Col. Boulanger he published the first French book on Wireless. This book was in great demand, and many successive editions were printed.

Ferrié's next step was to introduce, in co-operation with M. Blondin, wireless transmitting stations operating on direct current, and the first of these stations was installed on the Eiffel Tower, an aerial being attached to the top of the structure. The station proved a great success, and transmissions from it were picked up by ships 1,860 miles distant. The Eiffel Tower station was the first to send out the now familiar time signals, and these have been broadcast since the year the station was opened. These signals enable navigators, and others who want the exact time, to regulate their chronometers to about 1/10 of a second. Later, scientific signals for comparing the local time, determined astronomically, of a receiving station with Greenwich time, which is correct to 1/100 of a second, were sent out regularly from this station. This important application of wireless to the problem of time correction was due primarily to Ferrié and the astronomers Driencourt and Claude. Such scientific signals are of gr at assistance to navigators and explorers.

Commandant Ferrié held appointments on many important committees. In 1912 he represented France at the International Electricity Congress at St. Louis, America, and at the International Radio-Telegraphic Conference at London. At the request of M. Janet, Director of the Ecole Supérieure of Electricity, he formed a branch known as the Ecole Supérieure of Radio-Telegraphy. The course of tuition lasted three months and included special lessons on wireless, and was open only to army and naval officers. This branch of the school was suspended during the War period but was resumed in 1919. The course has since been considerably extended and now covers nine months, and in addition to army and naval officers it is open to French civil engineers. The school supplies the wireless telegraphists required by the French Army and Navy, the French Colonies, and industrial concerns.

The promotion of Commandant Ferrié to the rank of Colonel was a further advance in his career. During the War his work assumed a vast importance, and in the capacity of Technical Director of Military Wireless Telegraphy he was responsible for the efficiency of the wireless apparatus supplied to the armies. With characteristic thoroughness he supervised every detail, and the remarkable completeness of the French armies' wireless equipment drew from the Allies a request for similar equipment. Even the enemy carefully copied it. In this work Col. Ferrié was aided by a group of professors and eminent engineers whose researches and labours he directed.

On the advice of Col. Ferrié the aerial power of the

Eiffel Tower station was doubled, and additional high power French wireless stations were erected and equipped either with arc transmission or high-frequency alternators. A wireless station of 200 Kw. power was erected at Lyons, and its transmissions were heard as far away as Shanghai, and at Tananarive, Madagascar. At the end of the War the Croix d'Hins station was built in co-operation with the American Navy. This station had an aerial power of 500 Kw., and at the time it was built it was the most powerful wireless station in the world.

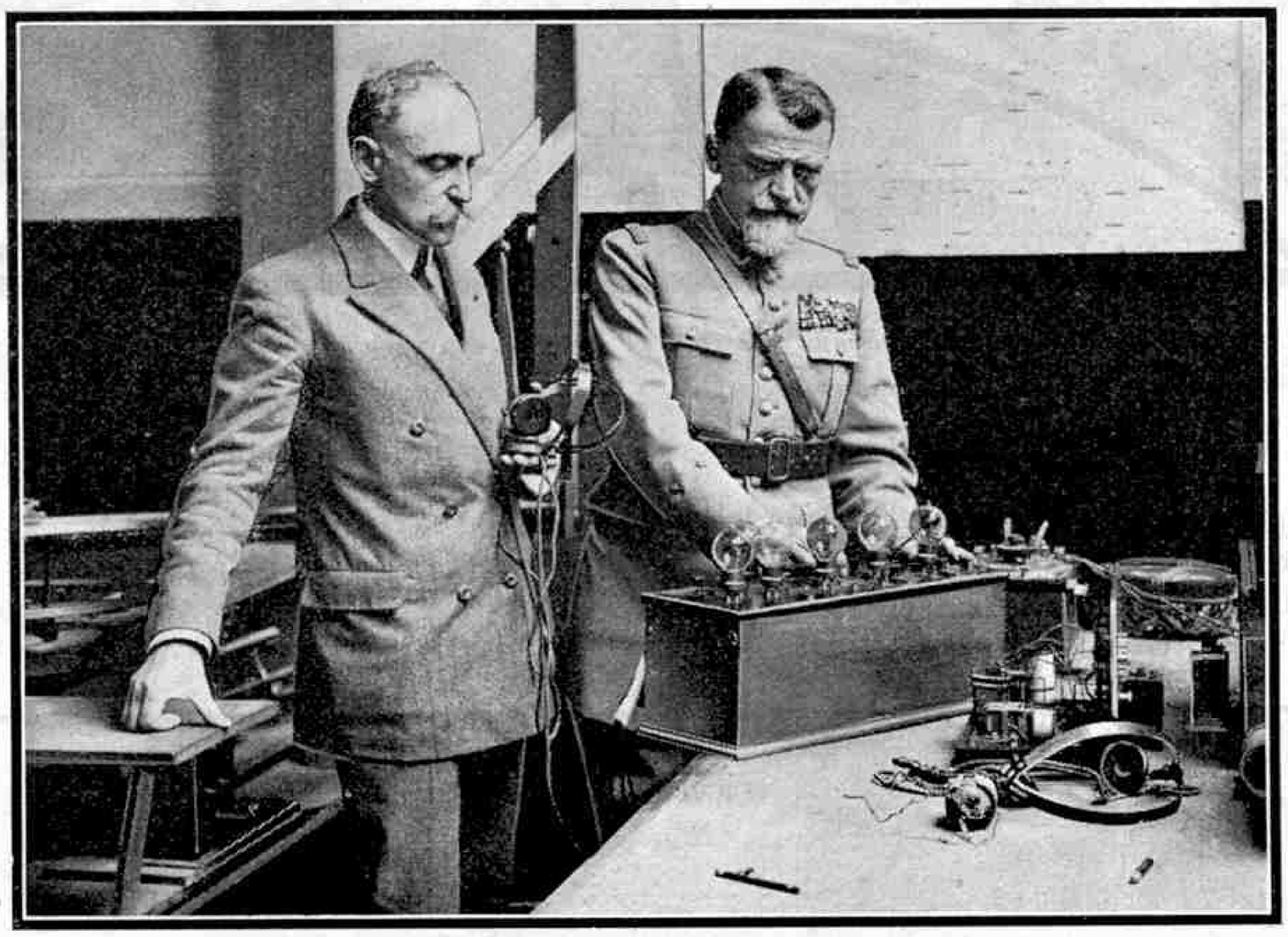
This period also witnessed the introduction by the Technical Director of Wireless Telegraphy of telemechanical appliances, and remarkable results were achieved by the wireless section of the Army in guiding aeroplanes by wireless from varying distances.

Appreciation of Col. Ferrié's work was reflected in his promotion to the rank of General. After the War he proposed and obtained a National Wireless Laboratory for the benefit of all Ministers of the Government who were interested in wireless telegraphy. He was made President of the International Union of Scientific Radio-Telegraphy, organised for international experiments and research; and he represented France at all the International Commissions gathered together for the purpose of regulating wireless telegraphic world traffic. At the same time his military duties became increasingly important, and he was consulted on the hundreds of questions that arose on the different problems of army movement.

General Ferrié received numerous honours during his distinguished and crowded career. He was twice honoured by the Institute of Science in pre-war days, being awarded the Kastner Boursault prize in 1904 and the Wilde prize in 1912. During 1919 he was honoured by the University of Oxford, and two years later by the Geographical Society, the Astronomical Society and the Society for the Encouraging of International Industries. In 1922 he was admitted to the Académie des Sciences, and in 1923 he was awarded the Franklin medal by America. He was honoured also by the Institute of British Electrical Engineers, and was president of many important engineering societies and associations devoted to the study of science.

General Ferrié was the holder of various foreign Orders, and in February, during his last illness, the Order of the Grand Cross of the Legion of Honour was conferred upon him.

For the information on which this article is based we are indebted to the courtesy of the Staff of General Ferrié.



The late General Ferrié at work in collaboration with Professor Mesny.

Crossing the Atlantic by Air—(*Cont. from p. 279*)

the British vessel, "*R.34*," on the return journey from Scotland to New York. A second British airship flight across the Atlantic was made as recently as 1930, when the "*R.100*," also under the command of Major Scott, visited Canada and then made a splendid return flight to Cardington.

For a time the exploits of these airships diverted attention from aeroplane crossings, for there seemed to be a prospect of the organisation of regular passenger services in these giant vessels between Europe and America. Airships suffer from many disadvantages, however, and the time scarcely seems ripe for the establishment of the promised services.

While airship flights were being tried, the difficult east to west crossing of the Atlantic Ocean was again accomplished in an aeroplane, this time by Air Commodore Kingsford Smith, the Australian pilot who had already crossed the Pacific Ocean in three long flights, and had afterwards made a record flight from Australia to Great Britain. In June, 1930, Kingsford Smith took off from Portmarnock, Dublin, in the "*Southern Cross*," the Fokker monoplane in which he had been the first to fly across the Pacific Ocean. He had with him two companions, and after battling with head winds that prevented him from reaching the American mainland, he landed at Harbour Grace, Newfoundland. From there he flew to New York and later went on to San Francisco, the point of his departure on his Pacific flight in 1928, thus completing a journey by air right round the world.

An even more remarkable westward flight across the Atlantic was made also in 1930 by two Frenchmen, Capt. Costes and M. Bellonte. Only two successful flights had previously been made in this direction, and in each case landing had been made on an island instead of on the American continent itself. The French airmen's aim was to carry out a flight that was the exact opposite of that of Lindbergh, and on 1st September they left Le Bourget with the intention of flying directly to New York. Their machine was named the "*Question Mark.*" It was a Breguet XIX, and had been used by the same airmen in September, 1929, when setting up a world's long distance record by flying from Paris to a small village in Manchuria. Flying on a course that took them over England and Ireland, they were seen next day passing an island near Newfoundland. They landed at Curtiss-Wright Aerodrome, Long Island, shortly after noon on 3rd September, having covered a total distance of about 3,700 miles in 37 hrs. 17 min.

The flight of Costes and Bellonte may be regarded as bringing to an end a stage in the aerial conquest of the Atlantic Ocean, for it conclusively proved that under favourable conditions aeroplane flights could be made across it in both directions. It did not prove that a direct service could be established, and it is probable that machines engaged on regular transatlantic flights would travel either by a more northerly route, or by one further to the south, in order to take advantage of islands that would enable the distance flown over water to be reduced.

Further flights on the routes followed by the great pioneers may be said to have little practical value. Nevertheless efforts no doubt will be made, and three such flights actually were made during 1931. One was part of a flight round the world made by Mr. Wiley Post and Mr. Harold Gatty in a Lockheed "Vega" machine, and a second was a record non-stop flight of 5,012 miles carried out by the American airmen Russell Boardman and John Polando, who flew from New York to Constantinople. Two Danish airmen, Capt. Holger Holris and Mr. Otto Hillig, were concerned in a third flight. They left Harbour Grace in a Bellanca monoplane in order to fly to Copenhagen, and eventually landed at Krefeld, near Düsseldorf.

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Building a Model Battleship

I find my greatest pleasure in " tinkering " at models, and most of my spare time is occupied in designing and building miniature ships and railway systems. I have no lathe, and make use only of ordinary household tools, but I have little difficulty in overcoming the constructional problems that arise. The total cost of each model is very low, for many of the fittings are made from odds and ends of material.

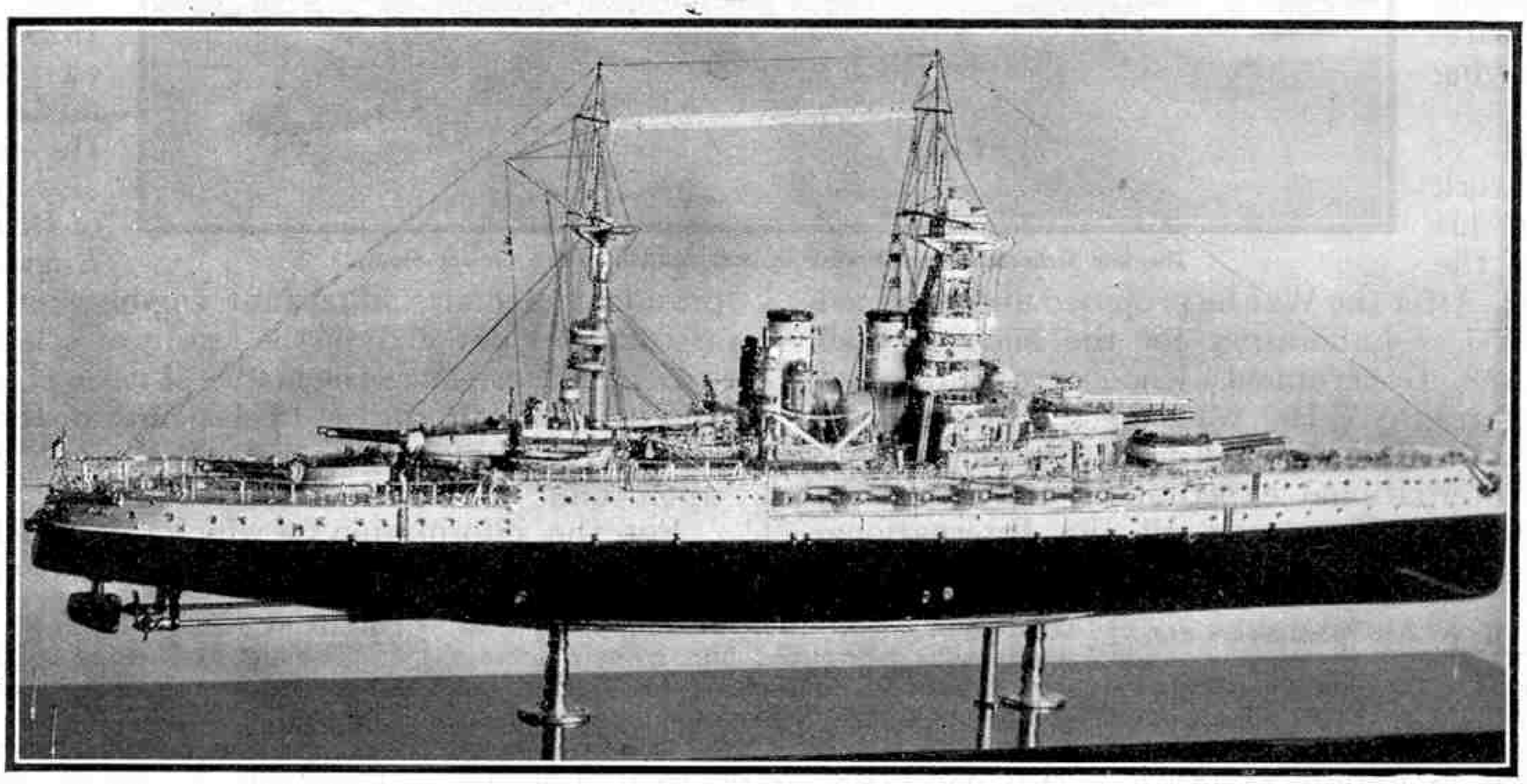
One of my most successful models is the reproduction of H.M.S. "*Queen Elizabeth*" shown in the accompanying photograph. This is 40 in. in length and is correctly proportioned. Electric light is fitted and the many details that give it such a realistic appearance include wireless aerials and a seaplane carried on the top of one of the fore gun turrets. The model is correctly finished in battleship grey with a red underbody, and the trimmings are painted a darker shade of grey. I find lacquer useful for small parts, but it is not good for the hull, as it dries too quickly.

I spent about 700 hours in building up the model, and the time does not seem excessive in view of the careful attention that had to be paid to every little detail. Even the lifeboats, which were built " bread and butter fashion," are equipped with miniature oars and lamps. The gun turrets and the rudder are built to be worked from a point near the bridge, while a 12-volt motor under the fore superstructure drives the screws. Each driving shaft is 24 in. in length and is constructed from thin brass curtain rod.

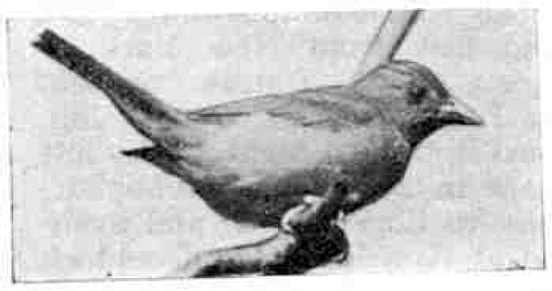
Needless to say the model attracts a great amount of interest. It is on public exhibition in a glass case, and the motor works when a push button on the side of the case is pressed.

I am now making a model of the "*Empress of Canada*," the well-known vessel of the Canadian Pacific Steamship Company. This will be 55 in. in length when completed.

G. S. REES (Nelson, British Columbia).



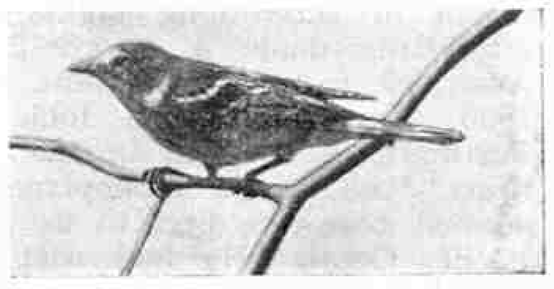
A splendid model of a famous British battleship " Queen Elizabeth," built by our reader, G. S. Rees, of Nelson, British Columbia. Another view of this model was reproduced on page 769 of our issue for October, 1931.



Bird Snapshotting

Last spring, owing to an accident, I was confined to the garden, and to pass the time I tried bird photography. My camera was a box-form one, with a focussing magnifier giving sharp pictures at 3 ft. I found a place where the camera could be wedged between two forking branches so as to point to a twig that seemed to be a favourite perch, and my exposures were made by means of string leading from the shutter to my hiding place, by way of pulley wheels. All that remained was to set the shutter, hide, and hope for the best. I send you snaps of a Scarlet Tanager (left) and a Myrtle Warbler.

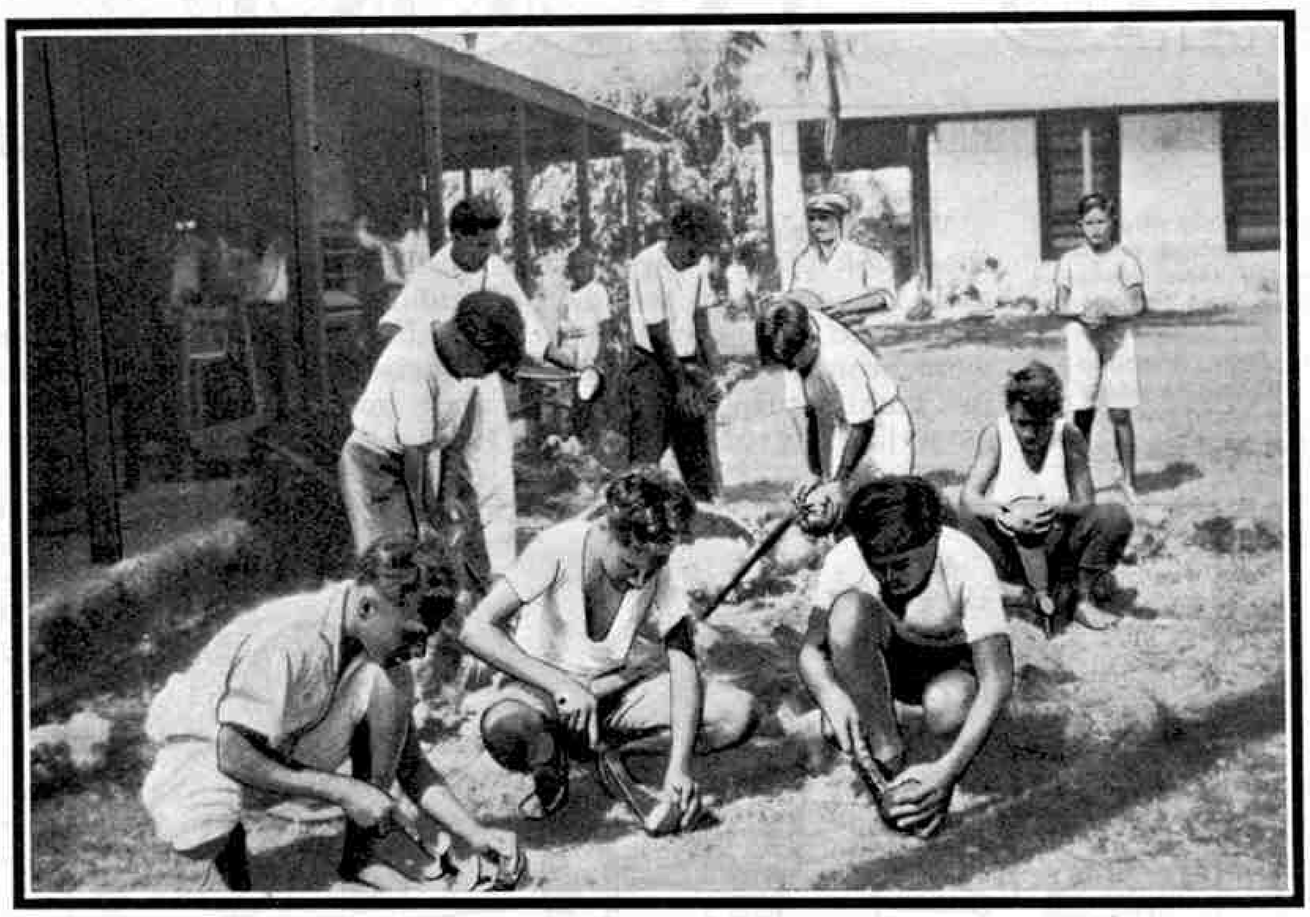
G. H. PITTS
(Paterson, New Jersey).



Life on a Pacific Island

I have lived on Niue Island, a tropical island in the South Pacific Ocean, for five years. On some maps the island is marked as Savage Island, and it lies 250 miles due east of Tonga. It is a huge coral rock, surrounded by high cliffs against which the surf breaks day and night with a continual roar, and is almost rectangular in shape, being 12 miles in length and eight miles in breadth.

When seen from the deck of a passing vessel, Niue has the appearance of a fertile land with deep soil and flowing water. In reality the soil is from four in. to six in. in depth, and the only water on the island is rain water, which is collected in great concrete tanks. There is a moderate rainfall, but as the soil is extremely porous the water disappears very quickly, and a few weeks drought would have serious results if storage accommodation were not provided. In view of these difficulties the wealth of tropical vegetation on the island is remarkable. Coconut trees grow almost everywhere, while oranges, lemons, limes and bananas are cultivated in many parts of the island. One section on the eastern side is covered with dense bush, and there trees from 80 ft. to 100 ft. in height, and from 4 ft. to 5 ft. in diameter at the base, seem to grow out of the solid rock.

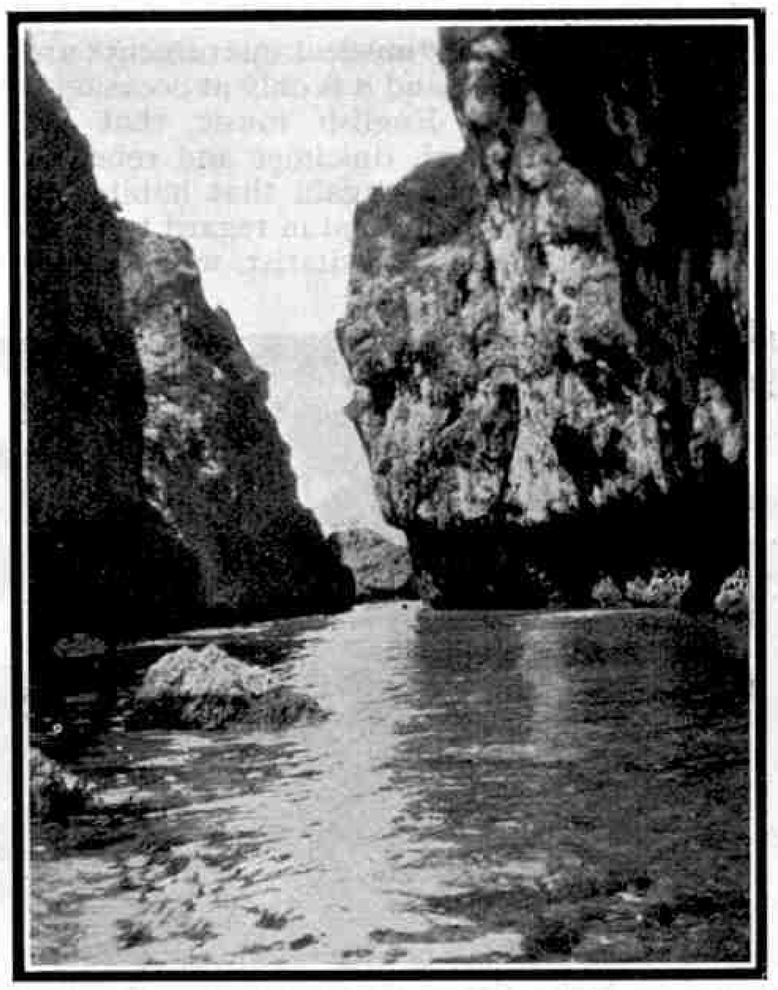


Natives of Niue Island at work making copra, the dried kernel of the coconut. This valuable material from which coconut oil is manufactured is one of the chief products of the island.

There are 12 native villages on the island and each has its own concrete rainwater tanks. The natives are naturally good at games and cricket, rounders and badminton are keenly enjoyed by the boys, while basket-ball and skipping are the daily pastimes of the girls. Boxing also is a great delight to the boys of all ages, and it is splendid to see two fat little brown fellows about six years of age pummelling each other for all they are worth with gloves nearly as big as their heads! When one is floored by a lucky blow, both shriek with laughter, and the victim hastily scrambles to his feet, eager to start again.

The chief port of the island is Alofi, on the western side, and I go to school there. The hours of the island schools are from 7 a.m. to noon in order to avoid attending during the hottest part of the day, and also to enable the native children to work on the plantations in the afternoons. The subjects taught are similar to those in ordinary schools, although with the exception of my sisters and myself the children attending are all Polynesians, and the boys receive special instruction in woodwork.

H. HAMILTON (Niue Island).



Matapa Chasm, a scene on Niue Island. For this photograph and the one reproduced above we are indebted to our reader, H. Hamilton, who lives on the island.

Re-stocking a River with Grayling

Last year I accompanied a party of anglers on a netting expedition to the River Wylye on Salisbury Plain. Our purpose was to obtain grayling and other coarse fish in order to restock the Avon. The part of the river from which our fish were to come is near Wishford. It was then well stocked with trout and grayling, but the grayling were increasing in numbers too quickly and they were to be thinned out in order to enable the trout to develop.

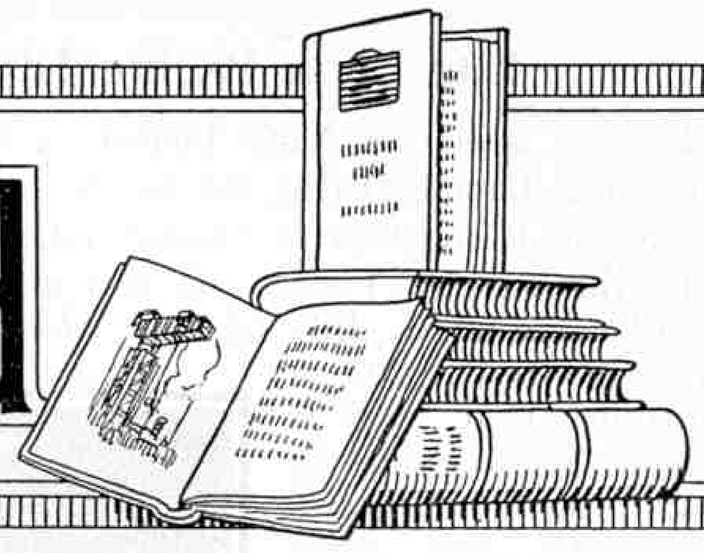
We left Bristol early in the morning taking with us buckets, ropes, nets, and a number of the large cans in which live fish are carried. These cans resemble churns, but are wider at the base and have perforated covers. On arrival at the scene of operations we were met by the four water bailiffs in charge of the section of the river from which our fish were to be taken. Two of them put on waders that reached to their armpits and stepped into the river, each taking one end of a net. This was carried right across the stream in order to trap the fish, and on reaching the bridge one of the bailiffs crossed the river, thus bringing both ends of the net to the same bank. When the net was pulled in, the grayling and other coarse fish were easily taken out and placed in the waiting cans, the trout being returned to the river.

The dragging continued, sometimes with two nets, until about 600 grayling, roach and dace had been obtained. A few pike also were caught, one of these being 3 ft. in length. The 12 cans in which the fish were placed contained more than we could carry away with us, and several hundred were left behind in the care of the head keeper, to be called for a week later.

The fish containers were then lifted from the river in which they had stood and placed in the lorry. On the return journey the water in them was kept in continual agitation by the movement of the lorry, thus enabling it to dissolve air and to remain fresh. If precautions of this kind had not been taken, the fish would have used up the oxygen contained in the comparatively small quantity of water in the containers. The grayling were taken to Sommerdale, Keynsham. There they were transferred to the Avon, the water in the cans being slowly replaced by that of the river in order to prevent a sudden change in temperature.

L. G. NORMAN (Bristol).

Books to Read



On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/- should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

"A History of Everyday Things in England—1500-1799"

By M. & C. H. B. Quennell
(B. T. Batsford Ltd. 16/6)

It is a difficult matter to review adequately a book that tells us of the many wonderful things that occurred during this important period of history. Especially is this the case when the story is told in such an interesting manner—when we are made to feel that we are sharing the lives of the people we are reading about. The book covers the period of the Middle Ages, and has many full-page and other illustrations, including a series of castles, half-tone plates of music, screens, halls, churches, etc.

The book is divided into three parts, each dealing with the period of a century, and we need only to read through the contents page to have our interest aroused. Almost everything of importance is covered, from such diverse subjects as the clothes of the people to the newspapers of the Middle Ages. We read of ships and galleons; trade and discovery; 16th century schools, colleges and games; cathedrals and clergy; windmills; houses and gardens; bands and musical instruments; artillery and early guns; hunting and falconry; circuses and theatres; food and hospitals; roads and town planning, and a host of other similar subjects that make fascinating reading.

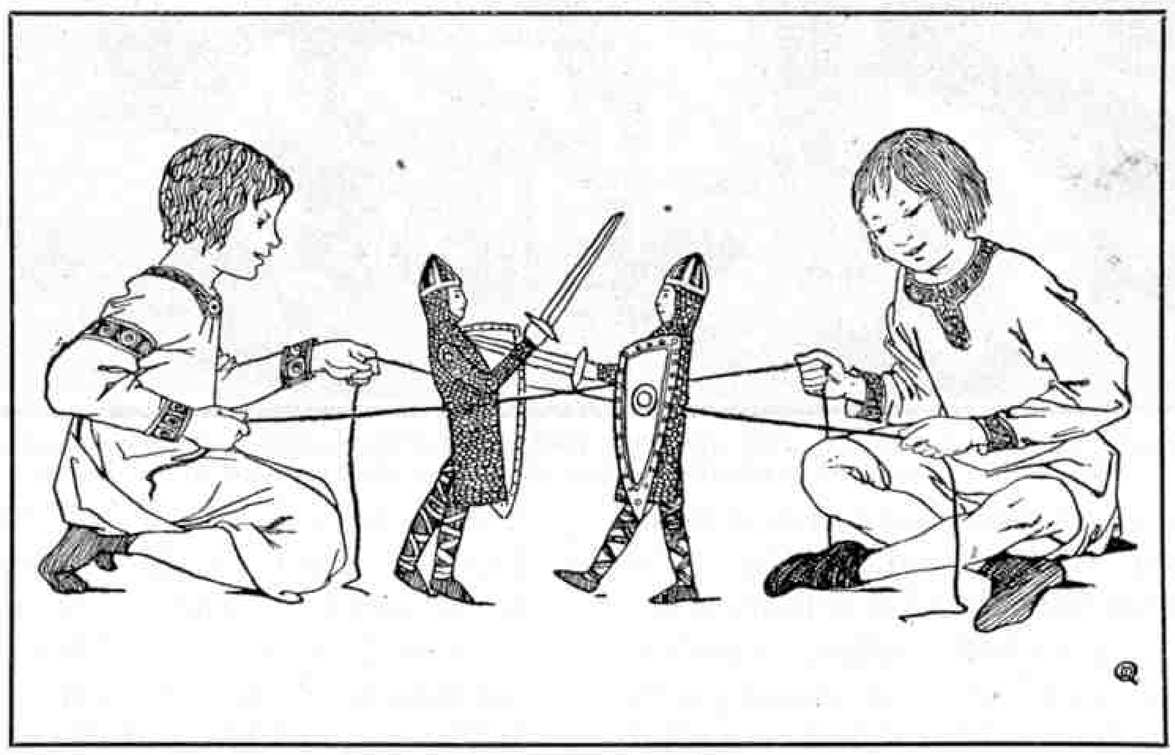
We find that many things we know of to-day were in use in the Middle Ages. For instance, some of our games were played by boys and girls hundreds of years ago. "If it were possible for a boy or girl who reads this book to meet a boy who went to a sixteenth century school, they would find they had a great deal in common, not only in the things they used, but what is more important, in the things they thought about." At St. Paul's School the boys were taught "all way in good litterature with laten and greke and good auctours such as have the veray Romayne eliquence joyned withe wysdome, especially Cristyn auctours that wrote theyre wysdome with cleve and chast laten other in verse or in prose."

We are helped to understand the change that took place between the Middle Ages and the modern world, particularly in regard to the great improvements that were brought about with the Renaissance in architecture, woodwork and music, as well as in other things. Incidentally, many of the early musical instruments are never heard now, and it is only at occasional festivals of old-English music that we hear the clavicord, dulcimer and rebec.

We are reminded again that habits are not changed a great deal in regard to food, for we find Pepys, the diarist, writing that "on September 8, 1663, being a wash-day, we had a good pie, baked of leg of mutton." Again, on June 15, 1664, "very merry we were with our pasty very well baked; and a good dish of roasted chickens, pease, lobsters, strawberries. Later on, come W. Bowyer and dined with us; but strange to see how he could not endure onyons in sauce to lamb . . . and so was forced to make his dinner of an egg or two."

It is interesting to learn that the circus was a popular form of entertainment centuries ago. One of the most famous circuses was Astley's, founded in 1774, when one Philip Astley commenced to give performances on horse-back on a piece of ground in the Westminster Bridge Road. The performance in an eighteenth century circus included "A curious Opera Dancer, with all the new attitudes, in a comic Dance, called the Dutch woman." There were also scenes depicting lion catchers, duck hunters and a storm. "The whole of the above exhibition to conclude with a Hornpipe in a most extraordinary manner." Between the acts was "an exhibition of beautiful fireworks," and various feats of horsemanship; and the whole performance concluded "with an amazing performance of men piled on men, or the Egyptian Pyramids."

The book is full of exceedingly interesting information, and is well illustrated with coloured plates, with numerous sketches in the text.



Two 13th century boys playing with jointed wooden soldiers dressed in armour of the period. The feet were weighted with lead to keep the balance and the figures were jerked backwards and forwards by means of a cord passed through their middle, each boy holding one end of the cord. From "Everyday Things in England" reviewed on this page.

Making "uppers" for boots. One of the illustrations from "Essentials of Life: Clothing" to be reviewed next month.

"Peter Garner, Cadet"

By John F. C. Westerman
(Ward, Lock & Co. 3/6 net)

When Peter Garner decided that he would go to sea in preference to working in an office or a bank, a position was found for him as apprentice or cadet to a well-known steamship company, and so he came to spend months chipping rust off decks and tarring ropes under the orders of a thoroughly unpleasant chief officer. Life in dungarees suited him, however, for he bore up cheerfully under all hardships and injustices, and in addition found many opportunities for showing the stuff of which he was made. The story is told in excellent style by Mr. Westerman, who can always be relied upon to write an interesting sea yarn; and it is scarcely surprising to find at the end of the book that, even after suffering shipwreck and spending several days in an open boat in the Indian Ocean, Peter again votes for a career at sea on the ground that it is a man's life. The reader who follows his progress as far as it is told in this volume will agree with him heartily, and will realise with him that the hardships of his early days helped to fit him for the greater responsibilities that were to follow.

"Bird and Other Nature Problems"

By T. A. COWARD, M.Sc. (Warne. 7/6)

In presenting a number of entertaining problems with which the student of nature is confronted, the author offers his own suggestions for their solution. To those who care anything about nature, the pages of this book cannot be lightly turned over, nor can the book be read and cast aside. Even an elementary study of the subject makes us think, for over and over again we are faced by problems and puzzled by apparently contradictory facts. The solution of these difficulties demands more thought than the most elusive crossword puzzle or the complications of a clever detective story.

Mr. Coward, already known as a writer on bird life, has for many years tried to discover the "how and the why" of some of these problems. There is, for instance, the problem of the abnormal increase in the numbers of starlings—a problem that not only threatens the welfare of other creatures in nature's strenuous competition, but already has had alarming results on man's food supplies. Apparently whatever man can do to combat the starlings, they will continue to increase until nature herself adjusts the balance in some unexpected manner. Another problem—and one that is of topical interest in view of the "sentence of death" passed on the grey squirrel by the London authorities—is the decrease in the numbers of our red squirrel and the increase of the American grey squirrel. The crossbill presents another problem—one that is not as serious as either of the two already mentioned, but one that enables us to study a bird whose habits and form are unusual and eccentric.

Caterpillars of the Puss moth. There are three caterpillars in the illustration. These queer creatures adopt attitudes that have a terrifying or combative appearance, distorting their bodies and raising themselves when they are disturbed or frightened by the approach of some enemy. From "Birds and Other Nature Problems" reviewed on this page.

Some space is given to the old controversy of the theories of intelligence and reasoning in bird and insect life. Mr. Coward thinks that theory is not wholly right nor wholly wrong, and that there is a half-way position that will solve many problems. Three chapters are devoted to suggestions rather than explanations concerning the problems of migration. In the matter of long-distance migration, it is now a proved fact that birds can accomplish more than was at one time believed. A chapter explains some of the methods by which records of travel are obtained, and another deals with the question of how animals find their way about. The terms "orientation" and "homing" are shown to be by no means synonymous—both have interest and both present problems, the solution of which will undoubtedly throw light on the mystery of migration.

Our present legislation in regard to bird protection is undoubtedly unsatisfactory. This is managed better in some countries than in others, and Mr. Coward has decided views on the problem of protecting birds wisely. In two chapters he describes his visits to the mountains and plains of Hungary and the methods there adopted to protect the bird sanctuaries. Four of his chapters deal with experience on the Danube, the greatest of the European waterways; nature in England in summer and winter; and an account of an autumn visit at a period of bird migration to a bird sanctuary in Norfolk.

In his final chapter Mr. Coward has a tilt at modern fashion, dealing with the unsolved human problem as to the original explanation of fashion changes. There may be some who object to being compared with certain domestic animals, but it does seem that many of us lack all initiative and are habit-bound and follow one of the flock. The fashion inventor well knows that all that is necessary is to capture the old wether and drag her through the gate—the rest will follow. From some points of view perhaps it is well that fashions do change. "What would become of the dressmaker, milliner, hairdresser, the tailor and shoemaker, if there were not frequent changes in fashions," asks Mr. Coward.

Twenty-four reproductions and photographs illustrate the various chapters and add interest to this fascinating book.

"Tail Waggers"

By A. CROXTON SMITH. (Country Life. 5/- net)

I am sure that almost every Meccano boy is a dog lover, and shares in the pleasures of the companionship of Man's greatest friend among animals. This friendship began in prehistoric times, and it is well expressed in the words of Robert Burns, quoted on the title page of Mr. Croxton Smith's book: "Man is the God of the dog; he knows no other; he can understand no other." The more intelligent interest that is now taken in dogs, and the greater attention that is being paid to their welfare, ensure a warm welcome for a production so full of excellent reading matter and splendid pictures as this volume.

From the many breeds of dogs in existence Mr. Croxton Smith has chosen 48 as his subjects. He describes the chief points of each, and gives interesting notes regarding its origin and special purpose. In addition he deals generally with the care of dogs, giving concise practical directions for housing, feeding and training them, and for dealing with the various ailments to which they are liable. Chapters are devoted to the important topics of choosing dogs and of bringing up puppies; and two sections that will be read with particular interest by all owners of dogs give excellent advice on the best methods of making friends with these animals, and of teaching them what the author calls "good manners."

To many readers the most attractive feature of the book will be the photographs with which it is illustrated. These are so liberally provided that every page has its picture, consisting of either a splendid head study or of one showing the general characteristics of a particular type. The head studies call for special mention, for whether they picture the small terriers such as Cairns and Sealyhams, or the giant Newfoundlands and St. Bernards, they illustrate in a remarkable manner the typical expressions of each type, all different, and yet all alike in intelligent friendliness.

Readers may be interested to know that these head studies may be obtained in a smaller volume published at 1/- net. This book includes concise descriptions of the chief features of each of the breeds illustrated, and forms an attractive and useful summary of dog lore.

"The Adventures of Paddy The Beaver"

By T. W. BURGESS
(The Bodley Head. 2/-)

The author of this little book is known all over America as "the Bed-Time Story Man," and in his books he tells us delightful stories about the creatures of the wild. We read of their enemies and friends, of their pranks, good times and travels, and in their reading we are gratefully reminded of Uncle Remus. From the age of 12, Mr. Burgess had to earn his own living at all sorts of odd places, but when his work was over he would go up into the woods to study nature. Later on he went into business, and when his little boy was on a visit to Chicago he wrote him a story every day and sent it to him to be read at bed-time. Eventually these stories were shown to a publisher, who brought out Mr. Burgess' first book. During the War Mr. Burgess determined to help his bird friends, and established sanctuaries where birds could not be harmed or killed. Up to now there are over 10,000 of these sanctuaries in America and Canada, and they cover an area of over eight million acres. It is only natural that such a lover of nature is able to write engagingly about the subjects he loves, and his stories, intended for children from four to 12 years of age, have not only a droll realism, but also show accuracy of observation.

This little book will make a good birthday present for a young sister or brother, and we look forward to other volumes in the series.

Suggestions Page

(262) Safety Device for Hornby Points

(J. W. Ward, London N.12)

Since the very early days of railways signalling systems have been the subject of much careful thought, and signalling arrangements have now reached such a high state of perfection that accidents are extremely rare. Elaborate precautions are taken to ensure the safety of passengers and goods, and many ingenious devices prevent any possibility of conflicting points and signals. The safety of a steam-driven train has hitherto depended to a large extent upon the driver's close watch of signals, and his prompt action when the signals indicate "danger." The Great Western Railway have tried with success an automatic train control system, whereby the train is stopped automatically if the line is not clear. When the train approaches a distant signal in the "danger" position a siren is sounded in the cab of the locomotive, and if this is disregarded the brakes are applied so that the train is pulled up before the next home or "stop" signal is reached. When the distant signal is in the "line clear" position the driver is informed by the ringing of a bell on the engine. This system of control facilitates railway working during fog and other adverse weather conditions that make it difficult, if not impossible, for the driver to observe the signals.

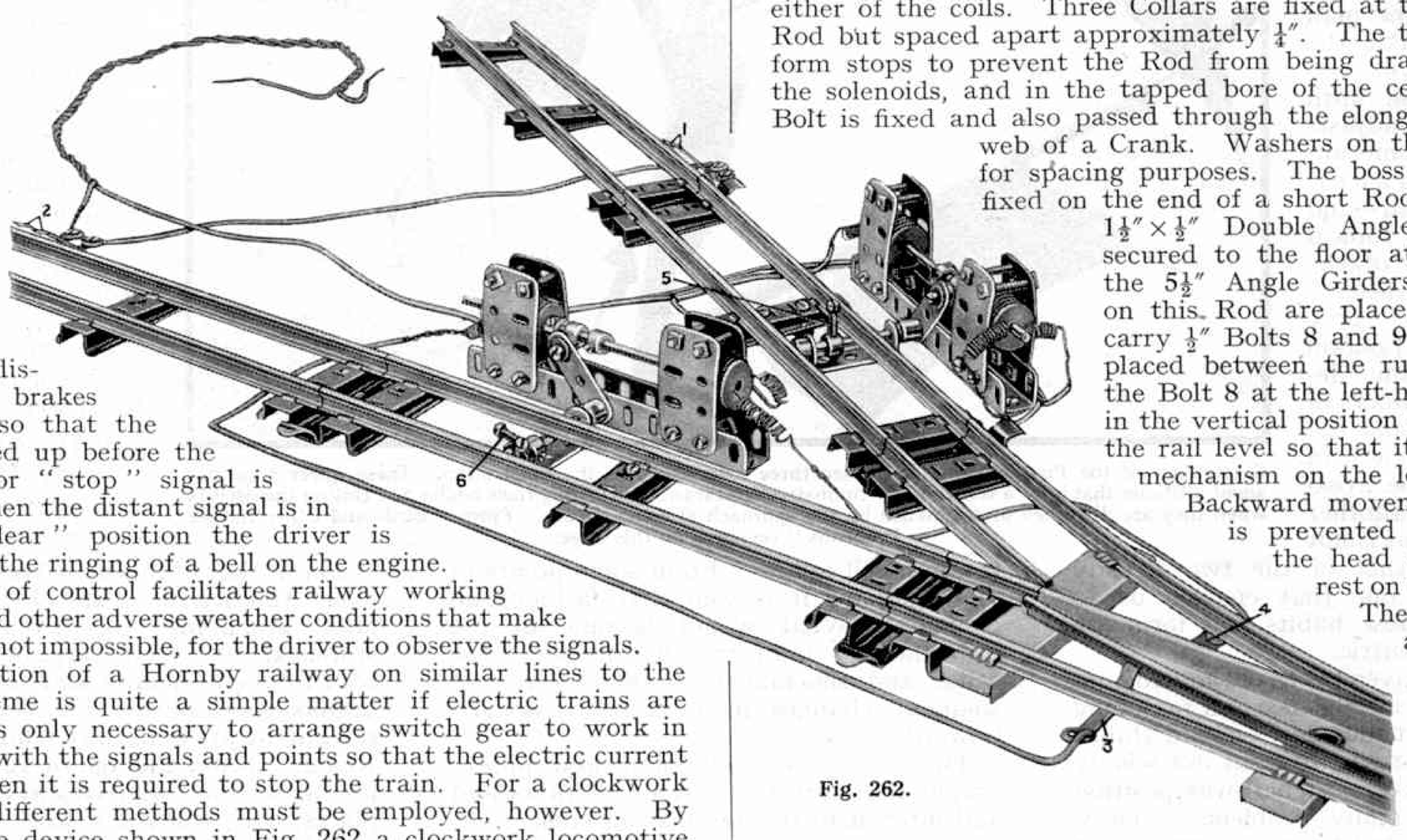


Fig. 262.

The operation of a Hornby railway on similar lines to the G.W.R. scheme is quite a simple matter if electric trains are used, as it is only necessary to arrange switch gear to work in conjunction with the signals and points so that the electric current is cut off when it is required to stop the train. For a clockwork locomotive different methods must be employed, however. By means of the device shown in Fig. 262 a clockwork locomotive is stopped automatically if the points ahead are not set correctly. The same system can be applied with equal success for stopping the train when the signals indicate that the line is not clear and, in fact, can be put to numerous other uses for preventing "accidents" on a Hornby railway.

The general arrangement of the track can be seen from the illustration. For convenience the control mechanism has been placed close to the points, but when in use the distance should be increased to allow sufficient length of track in which the locomotive can pull up after passing the brake rail. As shown the line is "all clear" for the straight track, or main line. The train travelling on this line towards the points is allowed to pass unimpeded, but on the branch line the Bolt 5 projects above the track and trips the brake mechanism under the Hornby locomotive, thus stopping it and preventing a derailment at the points.

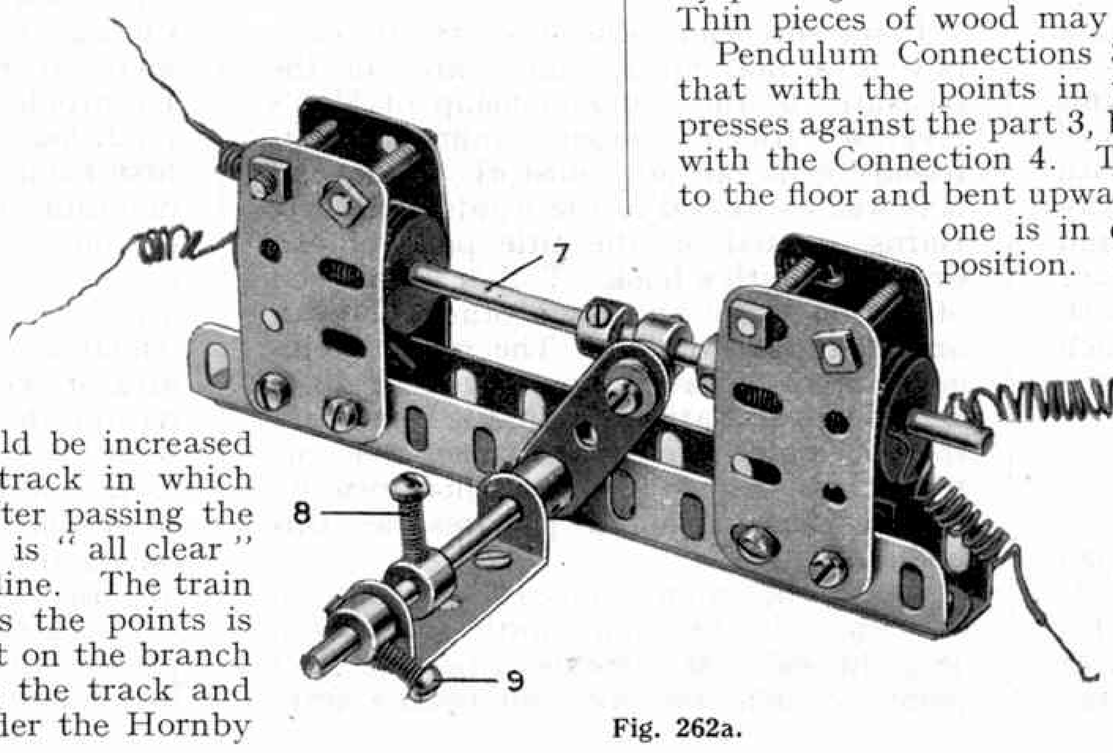


Fig. 262a.

One of the control devices is shown separately in Fig. 262a. This consists of two $5\frac{1}{2}$" Angle Girders placed together to form a channel section girder and screwed to the floor or table on which the lines are laid. Two pairs of 2" Flat Girders are bolted vertically to the Angle Girders and hold the solenoids in position. These are Bobbins wound to full capacity with No. 23 S.W.G. cotton covered wire, and are securely clamped in place by 1" Screwed Rods. The solenoids should be carefully adjusted so that the $4\frac{1}{2}$" Rod 7 slides freely when the electric current is passed through either of the coils. Three Collars are fixed at the centre of the Rod but spaced apart approximately $\frac{1}{4}$". The two outer Collars form stops to prevent the Rod from being drawn too far into the solenoids, and in the tapped bore of the centre Collar a $\frac{3}{8}$" Bolt is fixed and also passed through the elongated hole in the web of a Crank. Washers on the Bolt are used for spacing purposes. The boss of the Crank is fixed on the end of a short Rod journalled in a $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip that is secured to the floor at right-angles to the $5\frac{1}{2}$" Angle Girders. Two Collars on this Rod are placed as shown and carry $\frac{1}{2}$" Bolts 8 and 9. The Bolts are placed between the running rails with the Bolt 8 at the left-hand side. When in the vertical position it projects above the rail level so that it trips the brake mechanism on the loco as it passes. Backward movement of the Bolt is prevented by the Bolt 9, the head of which should rest on the ground.

The braking devices are placed in position beneath the track as shown in Fig. 262, and the track should be raised slightly to allow clearance for the rods passing underneath. This is done by placing Washers on the screws holding the sleepers to the floor. Thin pieces of wood may be placed under the sleepers instead.

Pendulum Connections 3 and 4 are placed in such a manner that with the points in their present position the switchplate presses against the part 3, but in the opposite position is in contact with the Connection 4. The Pendulum Connections are screwed to the floor and bent upward, but should be arranged so that only one is in contact with the switchplate in either position. Pairs of Pendulum Connections 1 and 2 are fixed at the side of the track and should be so fitted that they touch the wheel rims of the locomotive as it passes along the track. The placing of the parts directly over the rail should be avoided as this causes a series of bumps when the train moves over them. Normally the Pendulum Connections do not touch the rails and the electric circuit is consequently broken. (*Continued on next page, column 1*)

(263-4) Maltese Cross Mechanisms

(Victor S. Smith, Dublin)

The Maltese Cross mechanism derives its name from the shape of the driven member which, as the name implies, closely resembles a Maltese Cross. It is also called a Geneva Wheel, as it is similar to the Geneva stop used to prevent the overwinding of springs in watches, etc. The Geneva gear converts the continuous rotary motion of the driving member to intermittent motion, the driven rod rotating a quarter of a revolution for each complete turn of the driving shaft. This intermittent motion is utilised to a large extent in cinematographs for drawing the film through the "gate." In this case the pause is arranged when the picture on the film is in position for projecting on to the screen and the next picture is then moved into place, and so on.

Other uses for this mechanism are found in automatic machines where some part is rotated through a fraction of a revolution. It is not essential that the part should be moved through a quarter turn each time. If, for instance, it is required to turn one-sixth of a revolution, a reduction gear of 1½ : 1 may be fitted to the driven member of the intermittent gear, so that the final driven shaft rotates once for every six revolutions of the driving rod.

The device shown in Fig. 263 is the most common type of Geneva gear, and operates remarkably well at slow speeds. It is not suitable for high speed work, however, and for this reason could not be employed in a model cinematograph, but other uses to which the device could be put are likely to occur in other types of models.

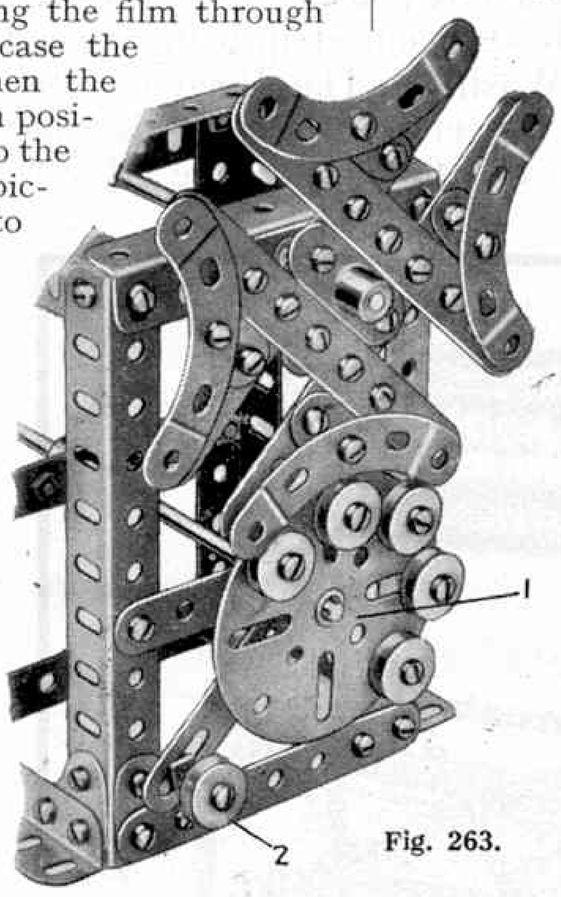


Fig. 263.

The driving Rod carries a Face Plate 1 to which five ½" loose Pulleys are attached by means of ⅜" Bolts fixed in position by two nuts. The Pulleys should be free to rotate on the bolt shanks. A Crank on the same rod is extended by a 2" Slotted Strip at the end of which is a ¾" bolt carrying the Pulley 2. The groove of this Pulley should be in a direct line with the grooves of the Pulleys on the Face Plate. The driven member is built up from 4½" Strips which are arranged to form four radial slots, and four 2½" small radius Curved Strips are secured in the positions shown by Flat Brackets. The complete cross is fitted with a Double Arm Crank at each side, and by this means is held on its rod.

The ½" Pulleys on the Face Plate prevent the cross from rotating until the Pulley 2 moves into one of the slots. As the driving member continues to rotate, the Pulley travels up the slot and in doing so rotates the cross until it moves through 90°. The Wheels on the Face Plate are then brought to bear on the next Curved Strip until the Pulley 2 is again in position for turning the driven member. The ¾" Bolt carrying the Pulley is adjustable in the slot of the Strip, and should be carefully placed so that the Pulley is in the correct position in relation to the slot of the driven "wheel."

The mechanism described above is somewhat cumbersome, and for this reason is unsuitable for use in small models. A more compact intermittent driving device working on the same principle is shown in Fig. 264. This device occupies very little more space than standard Meccano gearing. A Bush Wheel placed on the driving rod is fitted with seven Threaded Bosses, one of these being held in place by a 1" Screwed Rod 1 and a nut. The Rod should be inserted in the Boss next to the gap, and as it appears in Fig. 264 the driving unit can be rotated in a clockwise direction only, the reason for which will be seen.

A Coupling 2 carries two 1½" Axle Rods placed at right-angles, and is fitted on a Rod which also carries a "spider" removed from a Swivel Bearing or Universal Coupling. Four Threaded Pins are threaded into the tapped bores of this part and are arranged at 45° to the transverse Rods.

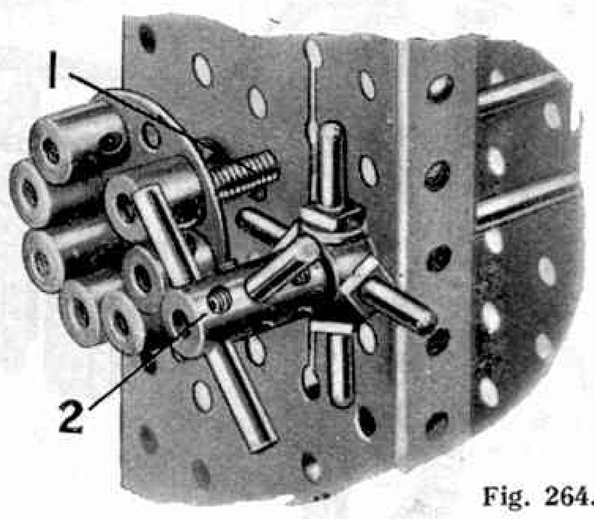


Fig. 264.

Safety Device—*(Continued from preceding page)*

When they make contact one brake moves to the "stop" position and the other to the "line clear" position.

The wiring-up of the control system can be followed from Fig. 262b. The two pairs of Pendulum Connections 1 and 2 are connected together and from them a wire is led to the accumulator. The other lead from the accumulator is attached to one of the wires from each of the solenoids 7 and 8. The remaining wires from these go to the solenoids 6 and 5 respectively. A wire from the coil 5 is attached to the Pendulum Connection 3 and the solenoid 6 is connected to the part 4. A train travelling along either of the tracks will complete the electric circuit as soon as the wheels touch the Pendulum Connections 1 or 2. The current passes along the rails to the points, which are set for the branch line (Fig. 262b) and are in contact with the part 4. The solenoid 6 is energised and draws the plunger into its core, setting the braking device at "danger." The electric current passes also through the coil 7 which causes the brake mechanism to be set for "all clear" on the branch line. If the position of the points is changed the solenoids 5 and 8 will be energised by the oncoming train.

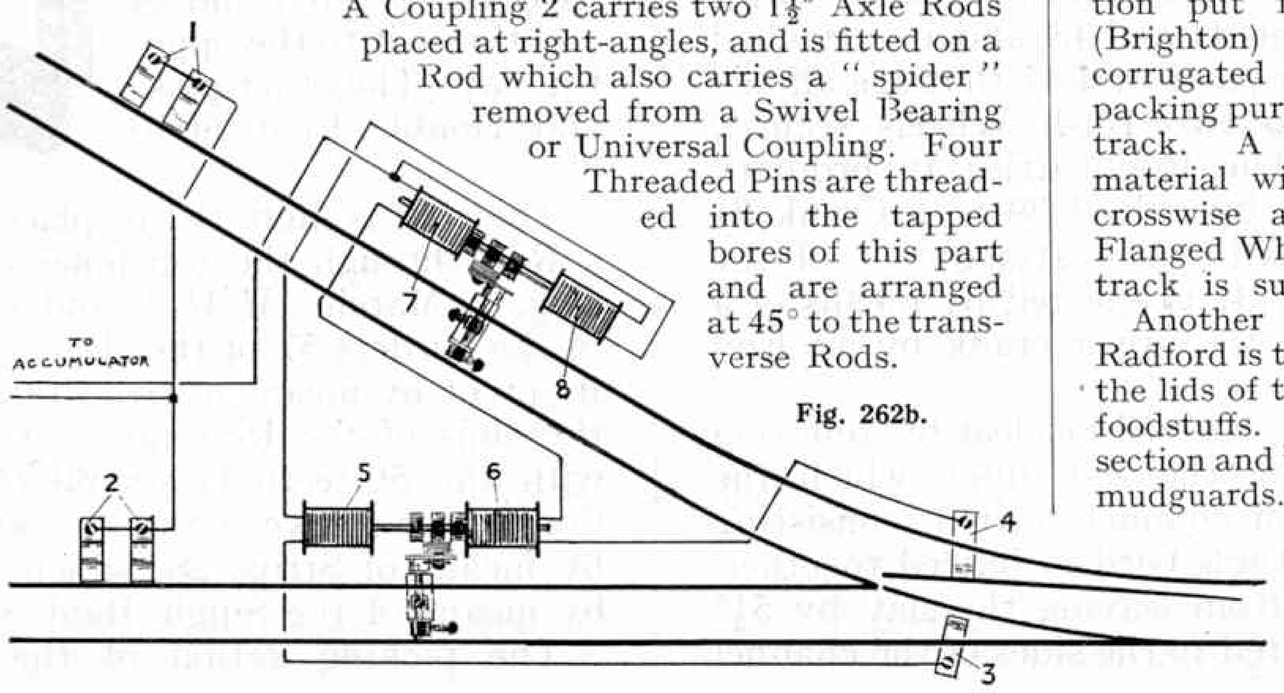


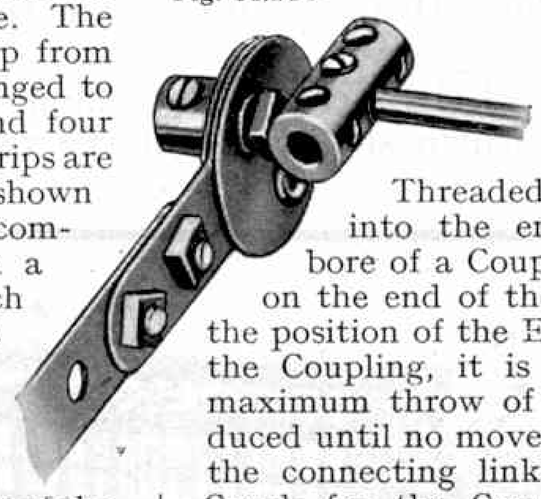
Fig. 262b.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.144). Variable Eccentric.—With the present range of Meccano Eccentrics it is possible to obtain throws of ¼", ⅜", and ½", and these will be found suitable for most purposes. Sometimes, however, the necessity arises for an Eccentric giving a different throw, and with R. Denton's (London, N.11) suggestion it is possible to vary the throw within very fine limits. It will be seen from Fig. M.144, that the Eccentric is not mounted directly on the shaft, but on a Threaded Pin screwed tightly into the end transverse tapped bore of a Coupling, which is secured on the end of the Rod. By adjusting the position of the Eccentric in relation to the Coupling, it is possible to obtain a maximum throw of ½", which can be reduced until no movement at all is given to the connecting link. By substituting a Crank for the Coupling, or by using a Triple Throw Eccentric further variations are obtainable.

Fig. M.144.



(M.145). Exciting Meccano "Road" Races.—E. Cramer (Southampton) informs us of a very interesting race game for out-of-doors. The models used for racing are "land yachts," which are lined up on a smooth surfaced "track" and rely solely on wind-power for propulsion. Each competitor is allowed to build any type of model provided it does not exceed certain measurements previously decided upon, so that the winner has the satisfaction of knowing that his success is due to his own skill in designing the fastest model. If a long track is available it will be necessary to use some device for keeping the models on a straight course, otherwise collisions will result. It will be seen that much depends upon the ingenuity of competitors, and there is sure to be very keen rivalry.

(M.146). Useful Improvised Accessories.—Caterpillar track has previously been dealt with in these columns but the suggestion put forward by R. O. Radford (Brighton) is worthy of mention. The corrugated cardboard that is used for packing purposes is the essential part of the track. A belt should be made of this material with the corrugations arranged crosswise and it may be passed over Flanged Wheels at each end. This form of track is suitable for light models only.

Another useful article suggested by Radford is the metal band used for securing the lids of the glass jars containing certain foodstuffs. These bands are of channel section and when cut in half make very good mudguards. Holes should be punched in the parts for securing them in place, and to finish them off they may be coloured red, green or grey with Meccano Enamel.

The New Meccano Loom

Completing the Mechanism and Beaming Frame

DETAILS for building the Loom framework and parts of the mechanism were published in the March issue of the "*M.M.*", and it now remains to describe the slay, Heald frames, and the special Beaming Frame.

The construction of the Heald frames should be quite clear from Fig. 9 (which shows one of the two frames removed from the Loom), and therefore we may pass on to their insertion into the Loom. Hooks on the ends of the Springs 59 (Fig. 9) depending from the lower extremity of the Heald frames, are attached to the Girders 20 (Fig. 1 in March "*M.M.*"). The Flat Brackets 60 at the tops of the frames are bolted to lengths of Sprocket Chain 42 and 44 (Fig. 4 in March "*M.M.*") respectively. These Chains pass over 1" Sprocket Wheels 41 and 43, and are attached finally by Hooks to 2½" Strips 45 and 47 that are affixed by ¾" Bolts and Nuts to two Bush Wheels secured rigidly to the Rod 49. The Rod carries an ordinary Crank, which is connected by a Rod 39 to a Crank 31 on one end of the camshaft. The attachment of the Rod 39 to the lower crank 31 is effected by means of a Swivel Bearing 30, and to the upper crank by an End Bearing 48.

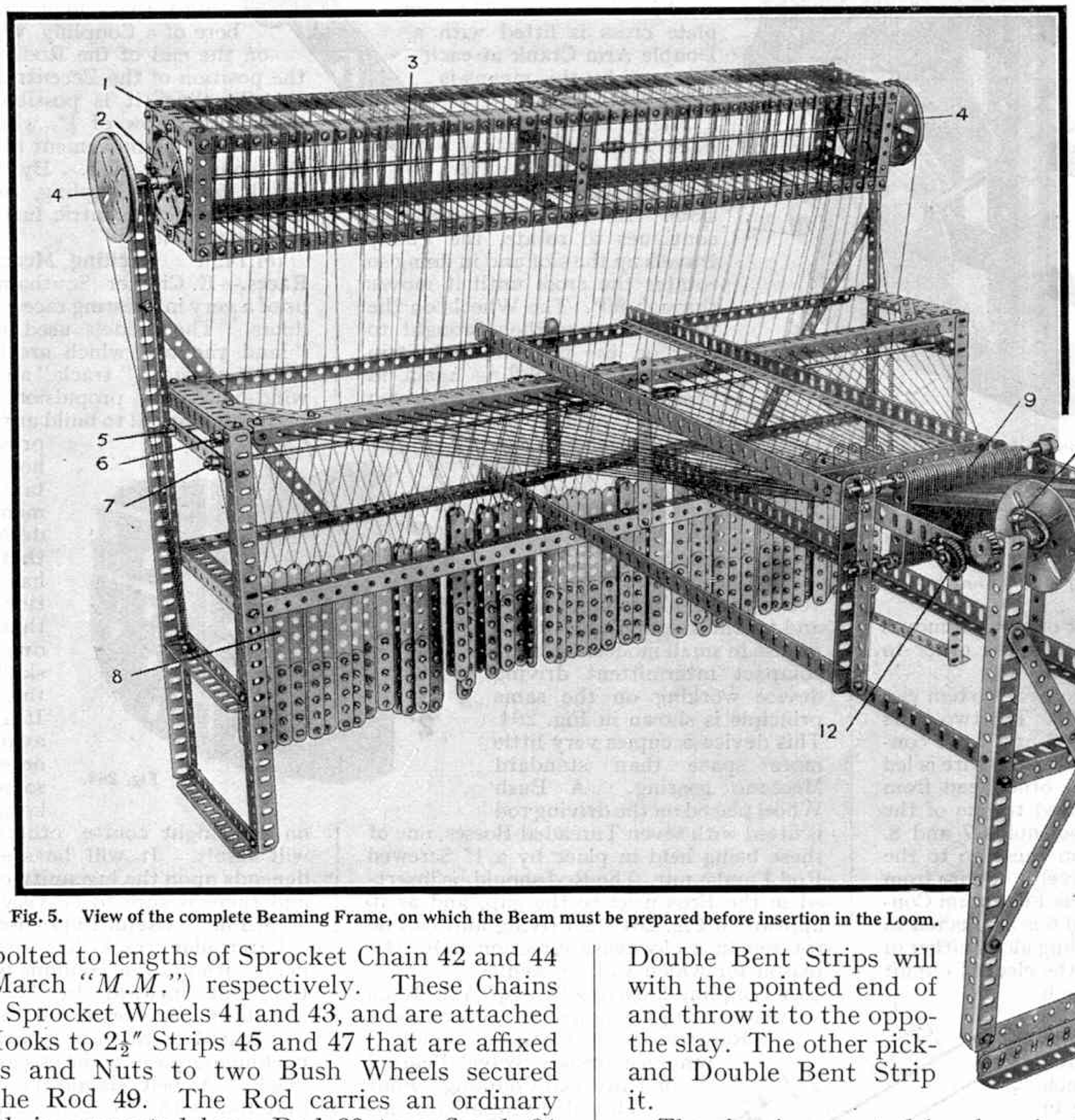


Fig. 5. View of the complete Beaming Frame, on which the Beam must be prepared before insertion in the Loom.

The main features of the slay will be clear by referring to Fig. 7. The portion of the slay upon which the Shuttle slides is a girder of channel section, consisting of two 12½" and two 2½" Angle Girders butted together. The Shuttle is prevented from leaving the slay by 5½" Flat Girders, which are bolted to the sides of the channel girder. Architraves at each end serve as bearings for the Rods of 1" loose Pulleys 26.

The Reed 51 consists of thirty-two 2½" Strips mounted on two Rods, each Strip being spaced apart the thickness of one Washer. The Reed is attached to the slay by passing the ends of the Rods carrying the 2½" Strips through the flanges of the 9½" Angle Girders 57. A length of Spring Cord 25 (Fig. 4) passes round each pair of 1" Pulleys and its ends are fixed to the lugs of a Double Bent Strip 27, which slides freely on the bed of the slay. The lower ends of the picking-sticks will eventually be attached to the Spring Cord and in this manner the Double Bent Strips are made to flick backward and forward, so that when the Shuttle is placed at one end of the slay, one of the Double Bent Strips will engage with the pointed end of the Shuttle and throw it to the opposite end of the slay. The other picking-stick and Double Bent Strip then return it.

The slay is mounted in place in the Loom by passing a Rod through the top holes of the Flat Trunnions 19 (Fig. 1, March "*M.M.*") and through the bottom holes in the Girders 57 of the slay. The slay is rocked about its pivot by means of two Cranks 29 (Fig. 4) secured on the ends of the Rod carrying the ¾" Pinions that mesh with the 50-teeth Gears 63 (Fig. 2, March "*M.M.*"). Connection between the Cranks and the slay is formed by means of Strips 28, which are attached to the slay by means of the Single Bent Strips 38 (Fig. 4).

The picking action of the model may be greatly

improved by lining the bed of the slay with a narrow strip of tin. This improvement enables the Shuttle to slide with considerably greater freedom.

As explained in last month's "*M.M.*" in order to turn out good work with the Loom, it is important that the threads of the warp should be wound on the beam evenly, and each individual thread must be laid on under exactly the same tension. For this purpose a beaming frame is employed. The Meccano model beaming frame is shown in Fig. 5.

The rotating frame 1 on which the various skeins of silk are wound, consists of four 24½" Angle Girders, bolts being inserted in the holes of each Girder throughout their length in order that the skeins may be kept separated from each other. A Face Plate 2, attached to each end of the frame, is secured to a Rod 3, which is journalled in the end holes of the vertical girders, and has brake drums in the shape of 3" Pulleys 4 fixed at each end. Cords are passed round the Pulleys under tension, which is supplied by Springs.

Each of the warp threads is led behind the Rod 5, through the top hole of each weight 8, and in front of the Rod 7. After leaving the Rod 7 the thread passes behind the Rod 6, and is taken through a hole in the front Girder as shown before it is inserted in the reed 9. This process is repeated with each warp thread in turn. All the warps are then fastened to the beam 11 by clamping them with a Rod 10 in the groove of the Wood Roller. This Rod is held in position by a ⅝" Rubber Ring, which is placed over each end of the Rod and the bosses of the Face Plates forming the end of the beam. A Pawl and Ratchet mechanism 12 is fitted to the beam spindle to prevent it from unwinding.

Each of the weights 8 is composed of a 5½" Strip to which three 2½" Strips are attached by five nuts and bolts. If the builder does not possess sufficient 2½" Strips, it will be necessary to construct some of the weights with other Strips to an equivalent weight.

One or two precautions must be observed before attempting to remove the beam from the beaming frame for insertion in the Loom. If all the silk has not been wound off the frame 1, the threads must be cut. Prior to this, a Rod should be clamped over the threads on the beam in a similar manner to the Rod 10 (Fig. 5) in order to prevent the threads from becoming loose and deranged; and a pair of Strips should also be clamped above and below the warp, just in front of the reed. This is to prevent the warp threads from pulling out of the reed when the warp is severed. The beam may then be removed from the machine.

Care should be taken to replace the Rod holding in place the turns of warp on the beam, and it should be removed only when the warp is secure on the take-up rollers.

When the Loom has been completed, it becomes necessary to take into consideration the pattern to be woven. Whether it be a hat band or a tie that is to be the first effort, the choice of colours for the warp and the weft—particularly the former—will call upon the artistic ability of the user to no little extent, in addition to manipulative ability in the actual process of weaving.

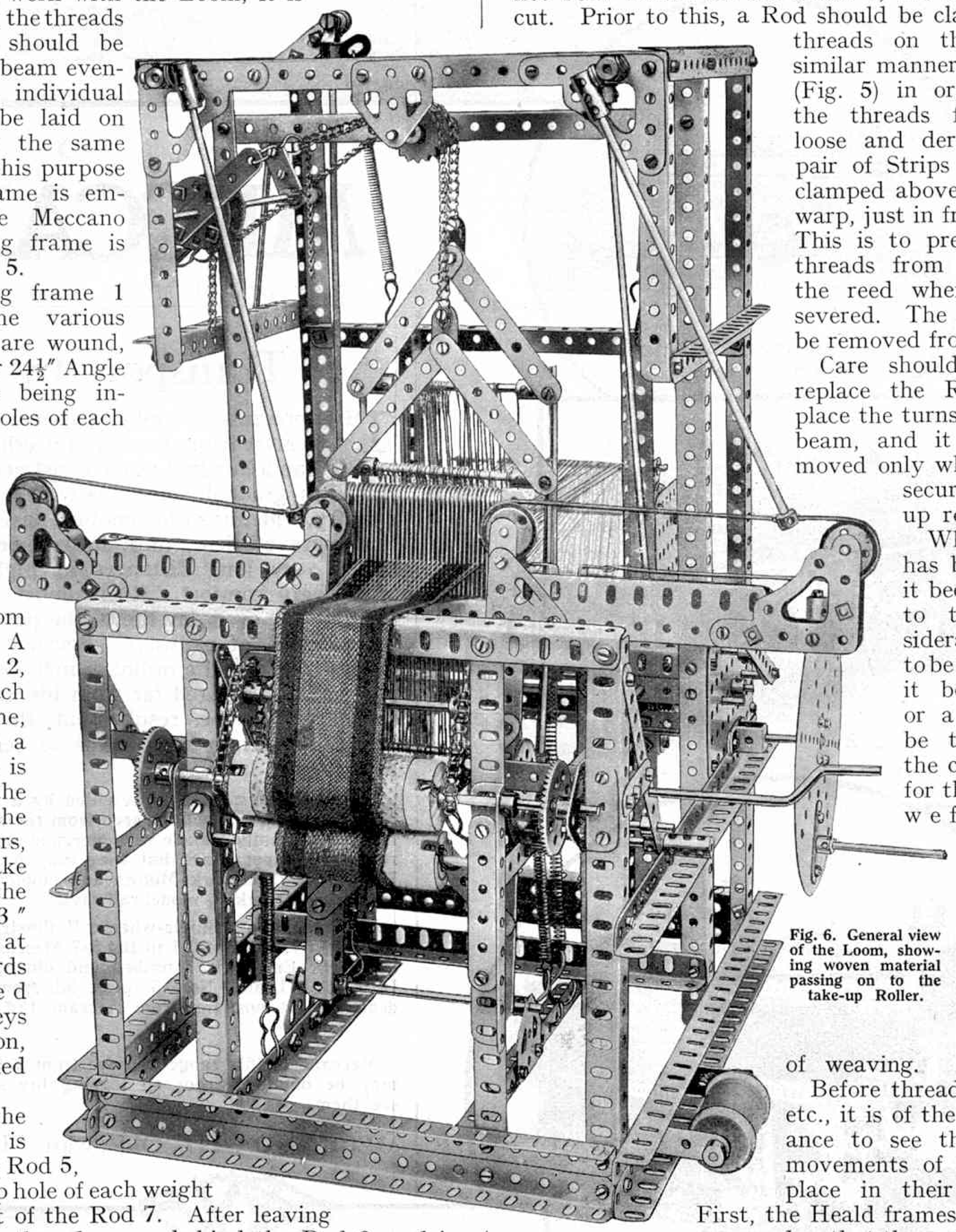
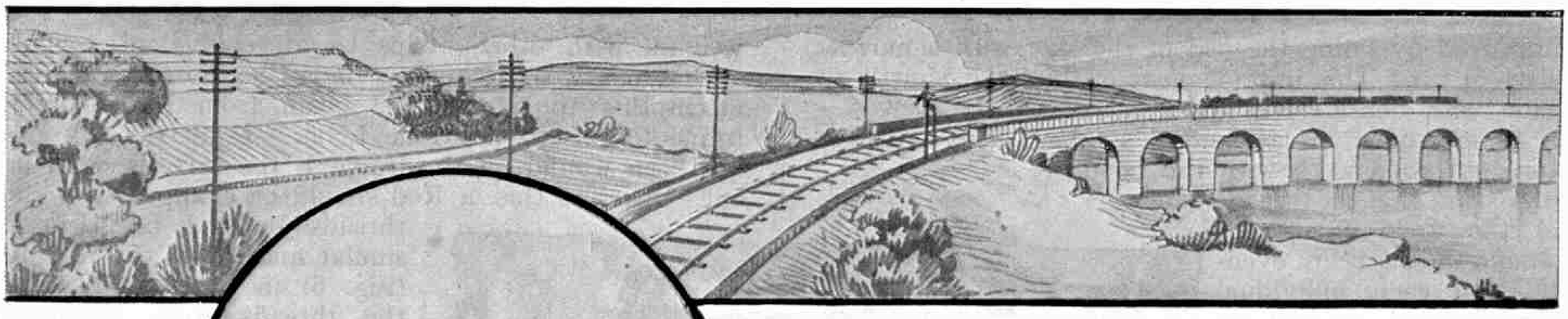
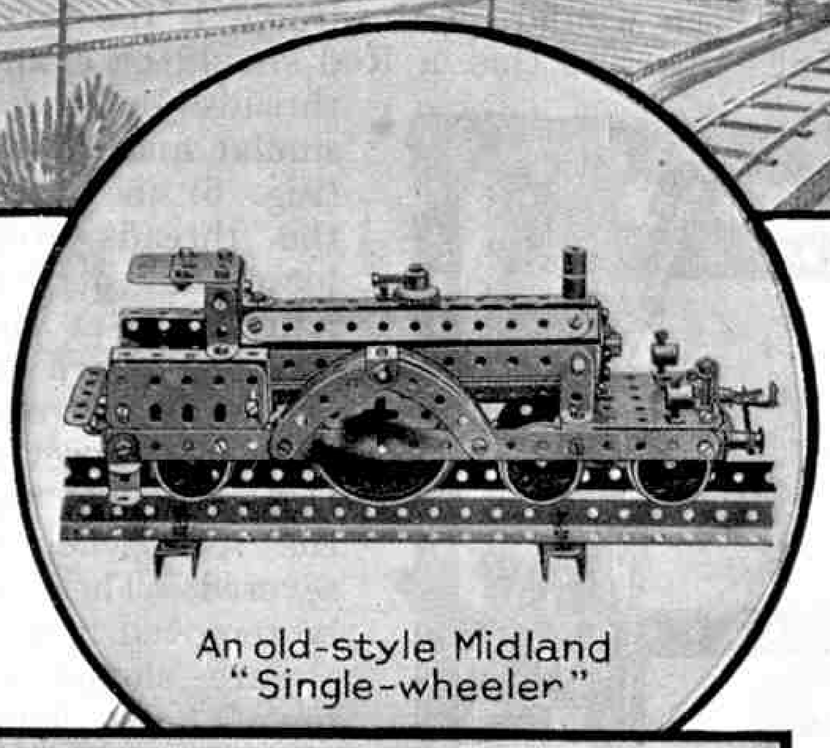


Fig. 6. General view of the Loom, showing woven material passing on to the take-up Roller.

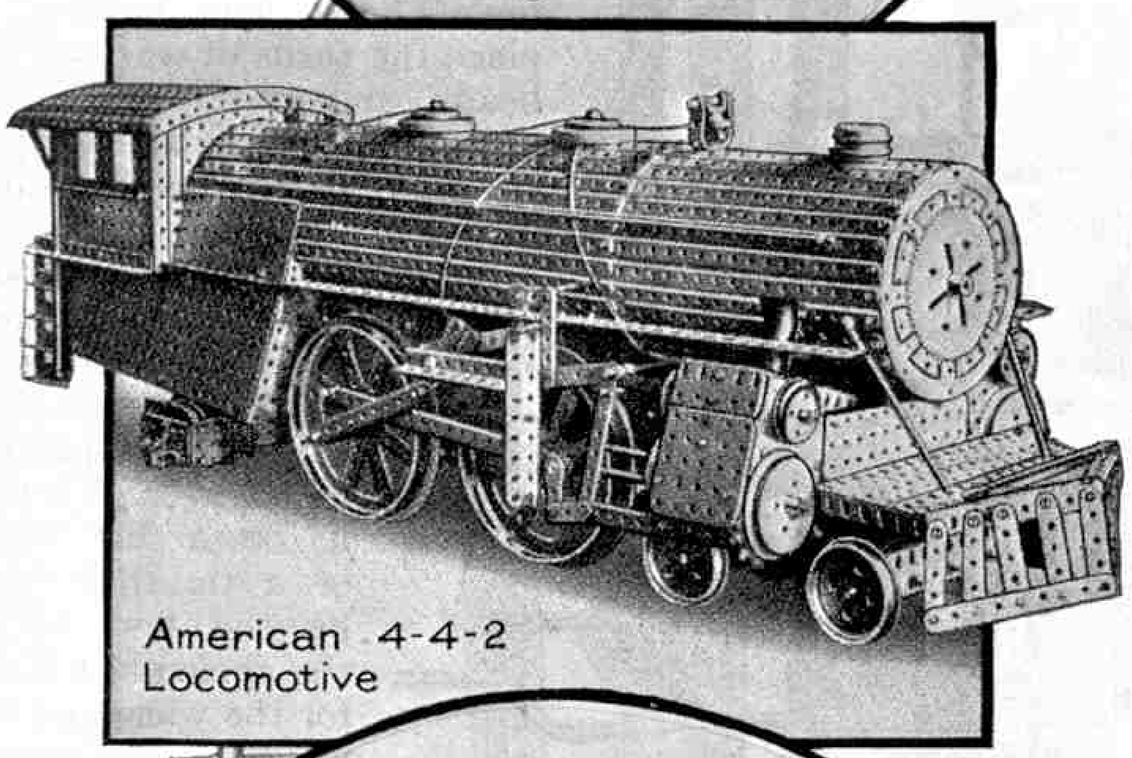
Before threading the Healds, etc., it is of the utmost importance to see that the various movements of the model take place in their correct order. First, the Heald frames should both be arranged so that the mails or eyes of the respective groups of healds coincide when the Crank 31 (Fig. 4, March "*M.M.*") is set vertically. Then, with one of the Heald frames raised and the other lowered to their greatest extent, the Cranks 29 should be turned so that the slay is as close as possible to the front Heald frame. The Cranks are then secured on the Rod. At the same time the picking motion must throw the Shuttle across the slay, and this cycle of operations must take place with unfailing regularity. Having made quite sure that everything is correctly adjusted attention may be paid to the actual threading of the Healds.

A single warp thread is passed through each mail of the Healds, the threads passing through the mails of the two Heald frames alternately. Care should be taken to

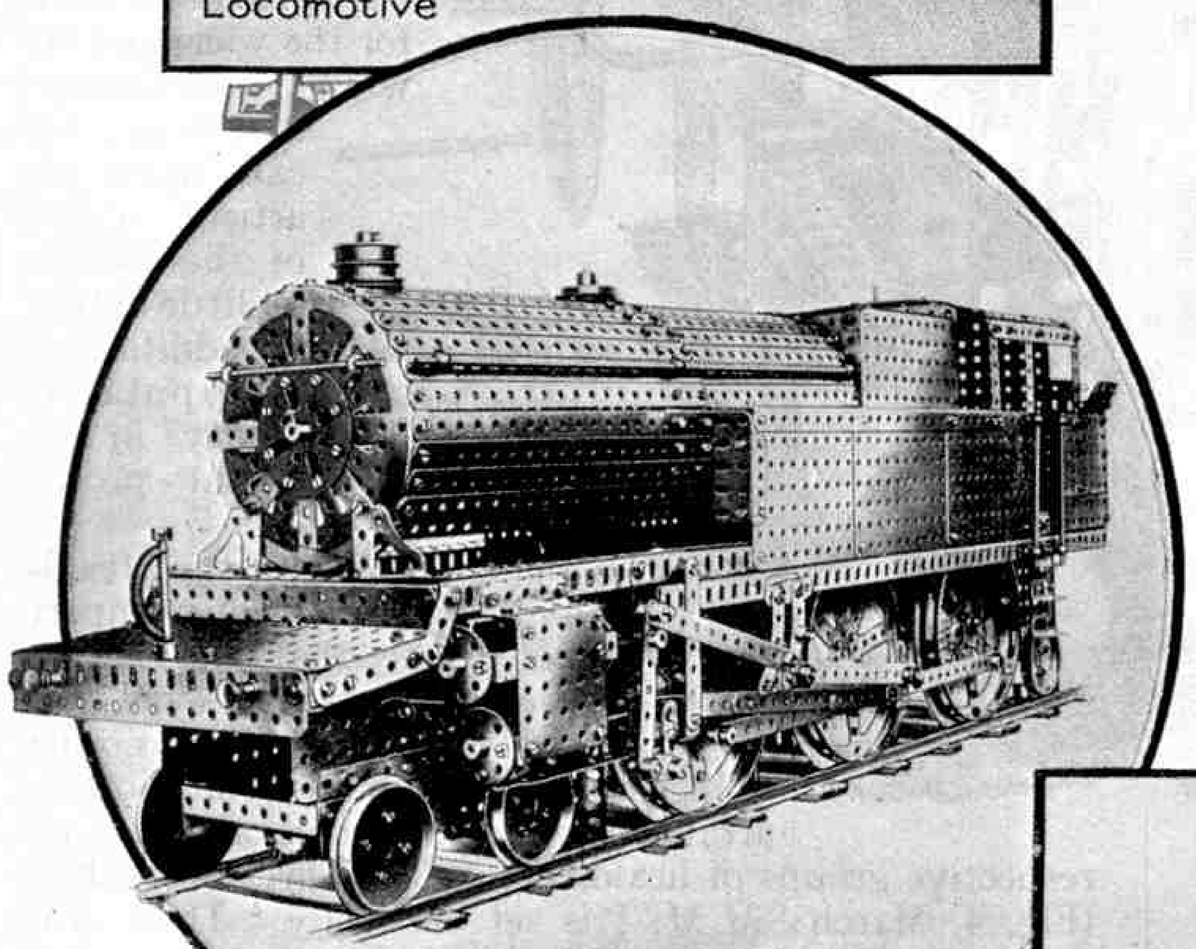




An old-style Midland "Single-wheeler"



American 4-4-2 Locomotive



A typical Meccano Tank Loco.

MECCANO

EXAMPLES OF MODEL CONSTRUCTION

2. Transport by Rail

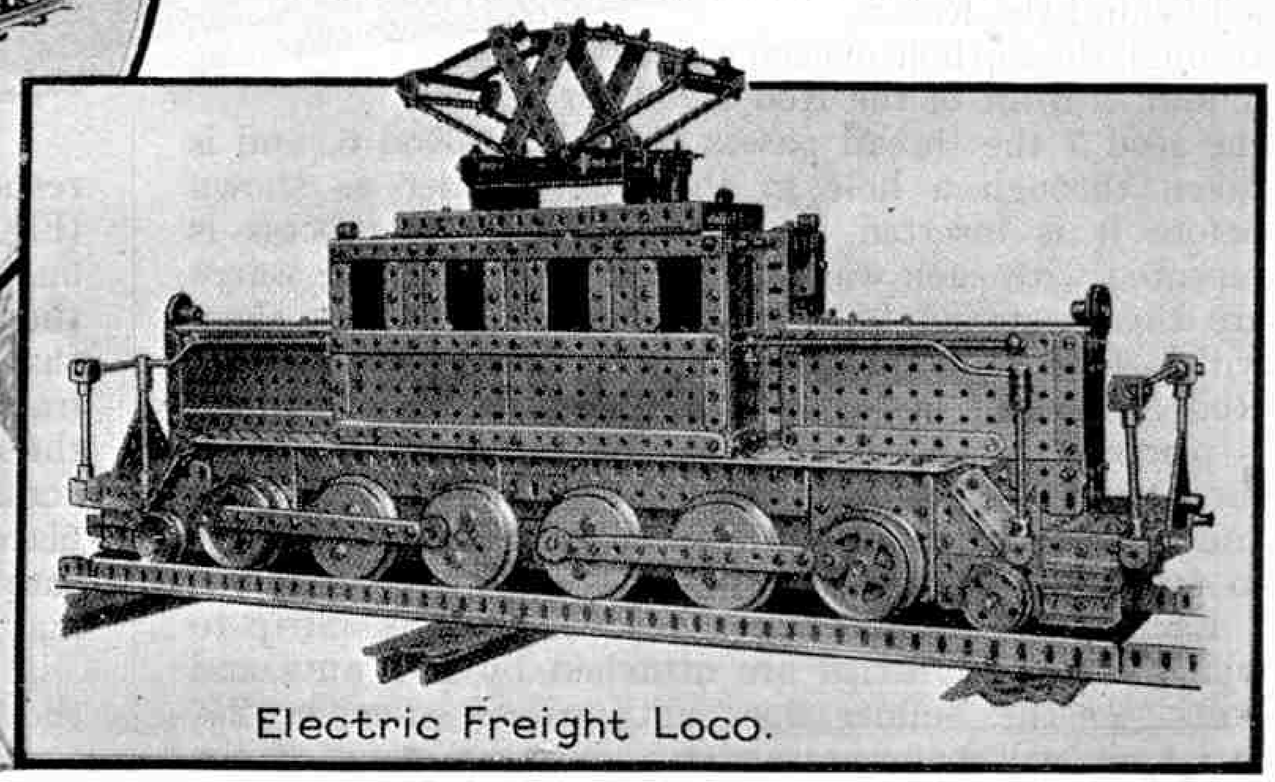
THE present-day railway system is one of the greatest triumphs of engineering. For more than a hundred years a vast network of steel rails has gradually been extending all over the country. Means of locomotion have grown more and more efficient, until to-day we are able to travel very long distances at high speed and with every comfort. It is almost impossible to imagine the everyday life of the public before the introduction of railways. Because of the difficulties of travel the ordinary individual a century ago seldom ventured far from his native town or village, with the result that the countryside beyond a certain radius was as remote to him as a foreign land.

Railway Transport is represented by a number of fine Meccano models, as will be seen from the examples shown here. Locomotives made with Meccano parts are not only realistic in appearance but they may be driven by the Electric or Clockwork Motors and employed in building up complete working model railways.

The old style "Single-wheeler" illustrated forms the subject of Model No. 7.4 in the 5-7 Meccano Manual, and the Tank Engine is described and illustrated in Special Instruction Leaflet No. 15 (price 3d. from any Meccano dealer, or 3d. post free from Meccano Ltd.).

Meccano Outfits range in price from 2/6 to 450/– and may be obtained from all leading toy stores. Ask to see them.

MECCANO LTD., Old Swan, LIVERPOOL



Electric Freight Loco.

see that none of the threads cross. One or more threads may be passed through each division of the reed, and attached to the take-up Rollers. The Meccano Reed Hook will be found useful for passing the threads through the reed.

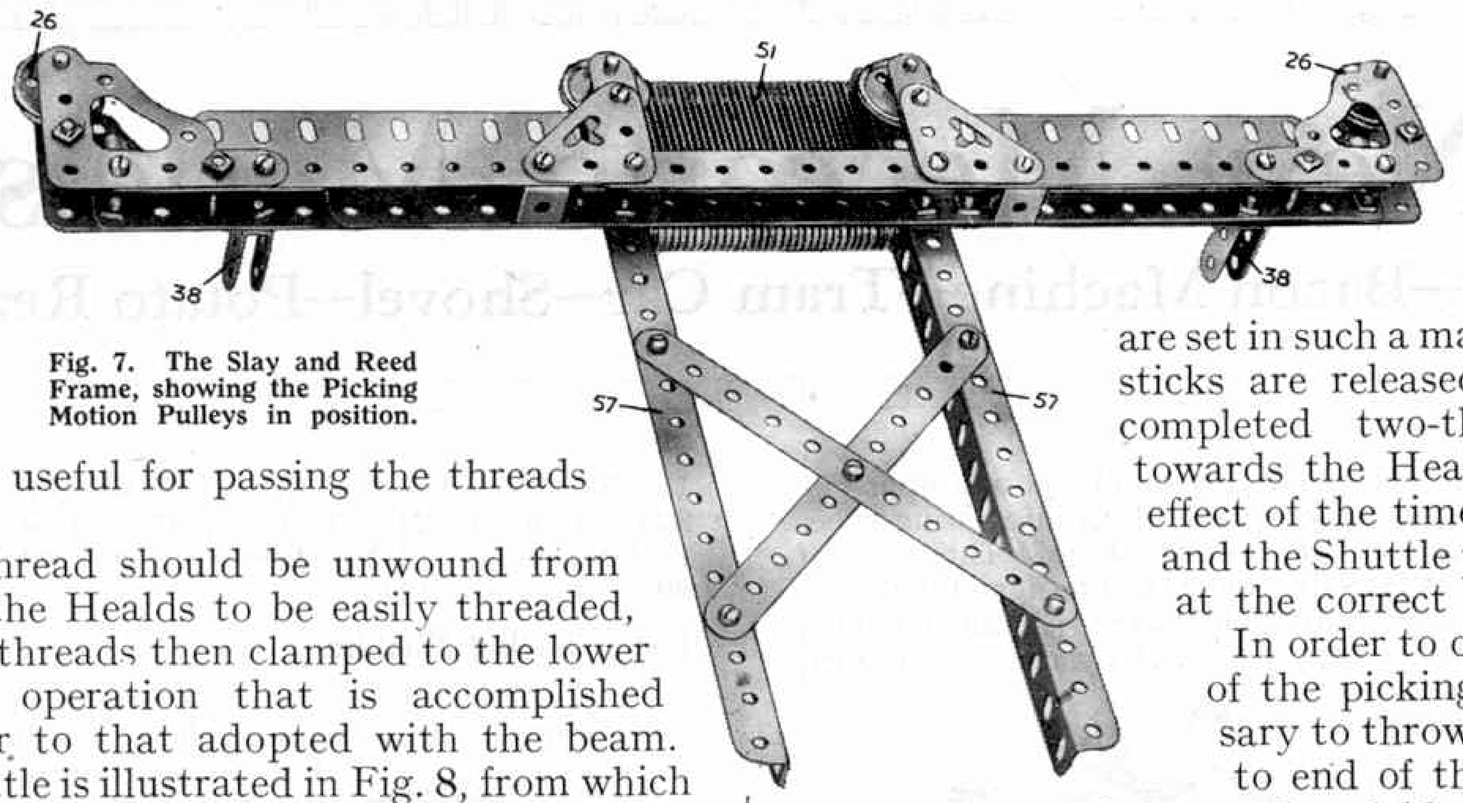


Fig. 7. The Slay and Reed Frame, showing the Picking Motion Pulleys in position.

Sufficient warp thread should be unwound from the beam to allow the Healds to be easily threaded, and the ends of the threads then clamped to the lower take-off roller, an operation that is accomplished in a similar manner to that adopted with the beam.

The Meccano Shuttle is illustrated in Fig. 8, from which it can be seen that it consists mainly of two parts, a shell and a " cop " on which the weft thread is wound. The latter may be quite easily removed from the shell, and may be wound with thread on the winding machine that is incorporated in the Loom. The winding machine consists of a Crank Handle (seen projecting from the right-hand side of the model in Fig. 6), on which is a 57-teeth Gear Wheel in mesh with a $\frac{1}{2}$" Pinion on a secondary Rod. This Rod has also secured to its outer end a Coupling in which the cop is held during the winding. The reel of thread is accommodated on a Rod 18 (Fig. 1, March *"M.M."*) which is carried in a $2\frac{1}{2}" \times 1"$ Double Angle Strip bolted to the base Girders of the Frame. After winding, the loaded cop is inserted in its shell, the free end of the thread being passed through one of the holes in the side of the shell and allowed to trail freely alongside when the Shuttle is placed in the slay.

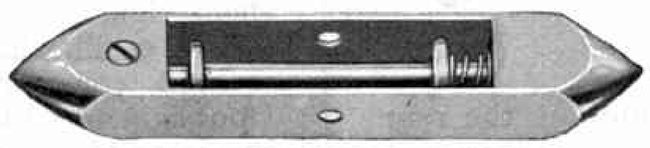


Fig. 8. The Meccano Loom Shuttle.

When the operating handle is turned, one of the Heald frames rises and the other falls simultaneously, thus " shedding " the warp. The slay moves up to the Heald frames, and as it pauses before commencing its return journey the Shuttle is thrown across the slay between the parted warp threads, leaving in its wake a trail of weft thread. On the return of the slay the reed drives before it loose thread left by the Shuttle, so forming what is termed the " first pick " of the weft. By continuing to turn the handle the process is repeated, but this time the Shuttle is thrown from the opposite end of the slay. The reed then presses the second pick into place against the first.

The taking-off rollers in the meantime revolve slowly and draw in the woven fabric as weaving proceeds.

Care should be taken to carefully adjust the Springs controlling the picking motion to ensure that the tension of both Springs is equal. Several experiments may be necessary before the Springs are in correct adjustment, but any trouble taken at this point will be amply repaid by the better quality of the woven cloth.

Another important point is the timing of the motion of the slay with that of the Shuttle. Here it may be mentioned that the Shuttle must shoot between the threads of the warp just at the moment when the latter are separated to their greatest extent, which coincides with the instant when the slay is nearest to the Heald frame. This adjustment is best carried out by arranging matters so that the cams operating the picking-sticks are set in such a manner that the picking-sticks are released when the slay has completed two-thirds of its travel towards the Heald frames. Thus the effect of the time-lag is counteracted, and the Shuttle passes across the warp at the correct moment.

In order to obtain the sudden jerk of the picking-sticks that is necessary to throw the Shuttle from end to end of the slay, the operating handle should be turned quickly at the point where the cam releases the picking-sticks.

We have not yet explained how the cop may be removed from the Shuttle. This is accomplished by extracting the grub-screw seen at the left-hand end of the Shuttle in Fig. 8. The cop will then move to the left under the action of the spring, and the right-hand end of the cop will drop clear of the Shuttle. It is advisable to mention that the purpose of the spring is to prevent too free rotation of the cop, which would lead to uneven edges in the woven material. If the spring is too strong, on the other hand, the Shuttle will not travel completely across the slay, owing to the braking effect produced. The spring should press quite lightly on the end of the cop, and if it is judged to be too strong, a turn or two may be cut off.

It will be realised that considerable strain is placed upon some of the Gears and Rods of the mechanism, and in order to prevent the Gears slipping on their shafts, all set-screws must be secured very tightly. If any parts are still found to slip on their Rods, especially in connection with the picking motion mechanism, the set-screws should be duplicated, thereby doubling their powers of resistance.

Where considerable trouble is experienced from this cause, it is a good plan to file a small flat in the Axle Rods immediately beneath the set-screws, thus providing a better gripping surface.

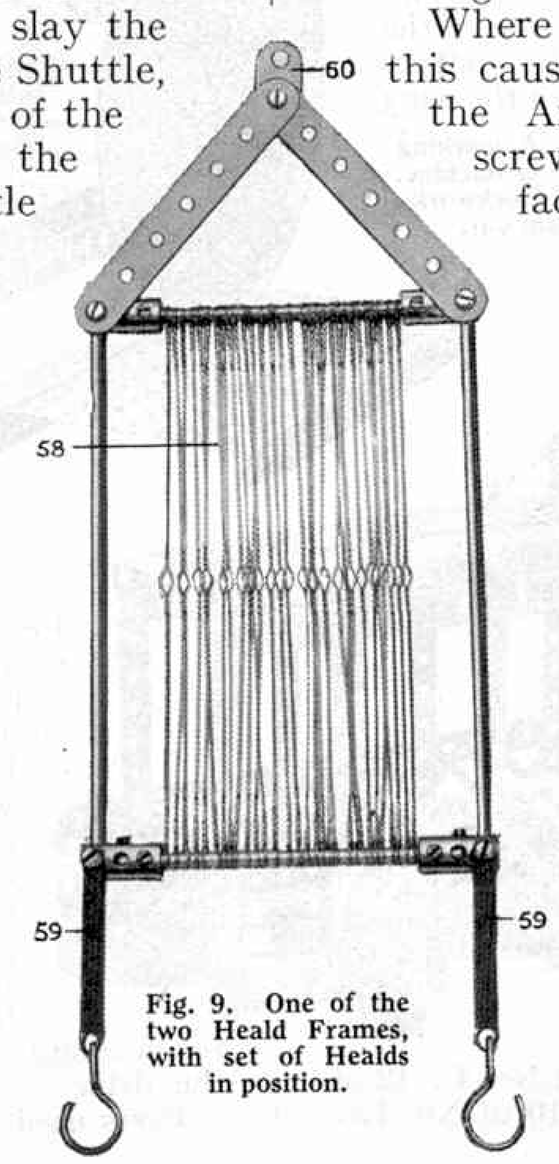


Fig. 9. One of the two Heald Frames, with set of Healds in position.

Before concluding it should be mentioned that the bottom set of warp threads, which are depressed by the appropriate Heald frame during one cycle of operations, must lie closely on the floor of the slay, otherwise the Shuttle may foul them in its passage across the slay. The upper set of threads also should receive attention in order to ensure that the Shuttle has a clear path between the two sets of threads. The adjustments necessary to effect this may be carried out simply by varying the lengths of Sprocket Chain 42 and 44.

To build the Beaming Frame the following parts will be required :—4 of No. 1a ; 62 of No. 2 ; 10 of No. 3 ; 2 of No. 4 ; 224 of No. 5 ; 12 of No. 7 ; 2 of No. 7a ; 6 of No. 8 ; 15 of No. 9 ; 7 of No. 9b ; 8 of No. 13 ; 2 of No. 14 ; 1 of No. 15 ; 3 of No. 16 ; 2 of No. 19b ; 594 of No. 37 ; 6 of No. 37a ; 90 of No. 38 ; 1 of No. 40 ; 3 of No. 43 ; 2 of No. 48b ; 21 of No. 59 ; 8 of No. 63 ; 3 of No. 103 ; 2 of No. 109 ; 6 of No. 111c ; 1 of No. 147a ; 8 of No. 147b ; 1 of No. 148.

New Meccano Models

Monoplane—Bacon Machine—Tram Car—Shovel—Potato Reaper—Ship

THE first example to be described this month is a simple but nevertheless realistic model aeroplane of an interesting type, a single-seater interceptor fighter monoplane. This type of military machine is of recent introduction and is designed for great speed and a particularly fast climb. The purpose of the machine, as its name implies, is to intercept and destroy raiding aircraft, bombers, etc., that have escaped the defence of the normal patrol machines.

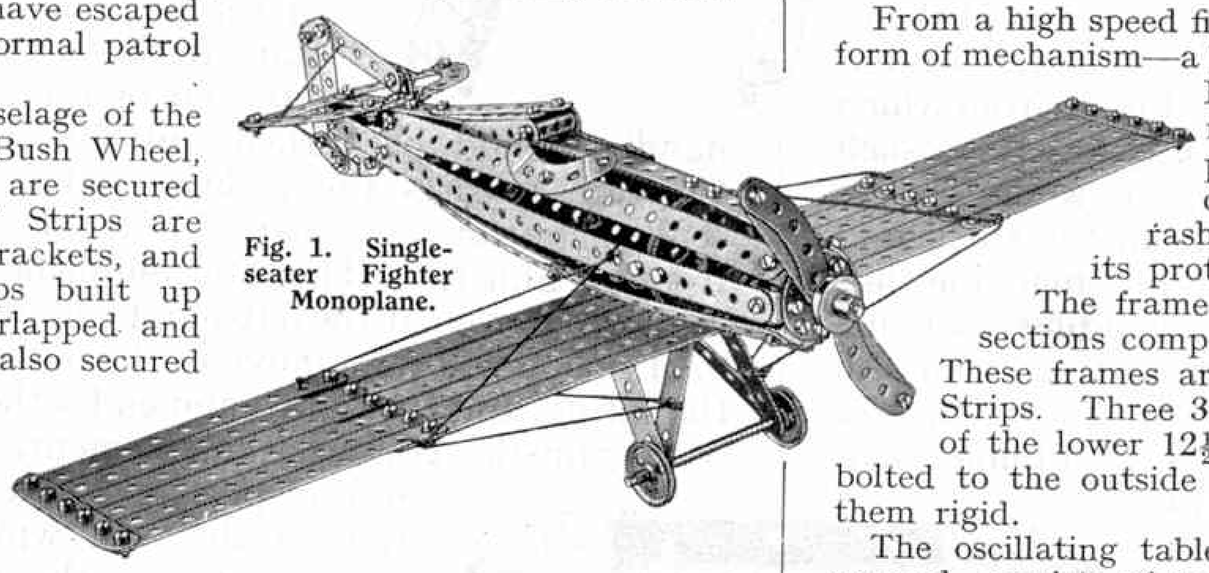


Fig. 1. Single-seater Fighter Monoplane.

The nose of the fuselage of the model consists of a Bush Wheel, and Angle Brackets are secured to this. Four 12½" Strips are fixed to the Angle Brackets, and four composite Strips built up from 5½" Strips, overlapped and bolted together, are also secured to the Brackets.

A 2" Pulley Wheel is placed between the Strips and held in place by Bolts, as can be seen in the illustration. The Strips are secured to the tail unit at the rear of the fuselage.

The tail unit is built up from 2½" straight and Curved Strips, the tail planes being held to the top of the fuselage by Angle Brackets. The pilot's cock-pit is represented by 2½" Curved Strips bolted to the sides of the fuselage. The back of the cock-pit consists of a Coupling held to the top Strip of the fuselage by a Bolt that is passed into the centre plain bore of the Coupling from below, and held in place by a Grub Screw. Two 3½" Strips are secured to the top of the Coupling by means of bolts to complete the "stream-lining" of the fuselage. Washers are placed under the heads of the Bolts holding the 3½" Strips in place, so that their shanks do not foul the centre transverse bore of the Coupling. A 2½" Strip is held to each end of the Coupling by means of a Bolt placed in the transverse bore of the Coupling and gripped by the Grub Screw.

The main plane of the model is built up from 12½" and 5½" Strips, and 3" Strips are bolted across the wing tips to ensure rigidity. The complete wing is bolted to the under-side of the fuselage. The undercarriage consists of two "V" struts composed of 2½" and 3½" Strips held to the lower side of the wing by means of Angle Brackets. A 4½" Axle Rod, fitted with two 1" Loose Pulleys, completes the undercarriage assembly.

The Propeller consists of a 5½" Strip, to which are secured two 2½" Curved Strips. The Propeller is mounted on a 1½" Axle Rod placed in the boss of the Bush Wheel, and is held in place at the outer end of the Rod by means of a ¾" Flanged Wheel. A Spring Clip is used to secure the Rod in position at the inner end. To complete the model the Meccano Cord bracing is attached to the main wing and tail unit, while model-builders who wish to do so may add "armament" in the form of machine guns composed of Axle Rods, etc.!

The parts that are required to build the model monoplane are as follows:—10 of No. 1; 18 of No. 2; 6 of No. 3; 2 of No. 4; 12 of No. 5; 2 of No. 6a; 7 of No. 10; 4 of No. 11; 10 of No. 12; 1 of No. 15a; 1 of No. 18a; 1 of No. 20a; 1 of No. 20b; 2 of No. 22a; 1 of No. 24; 3 of No. 35; 94 of No. 37; 13 of No. 38; 1 of No. 40; 1 of No. 48b; 1 of No. 63; 2 of No. 90; 4 of No. 90a; 4 of No. 111c.

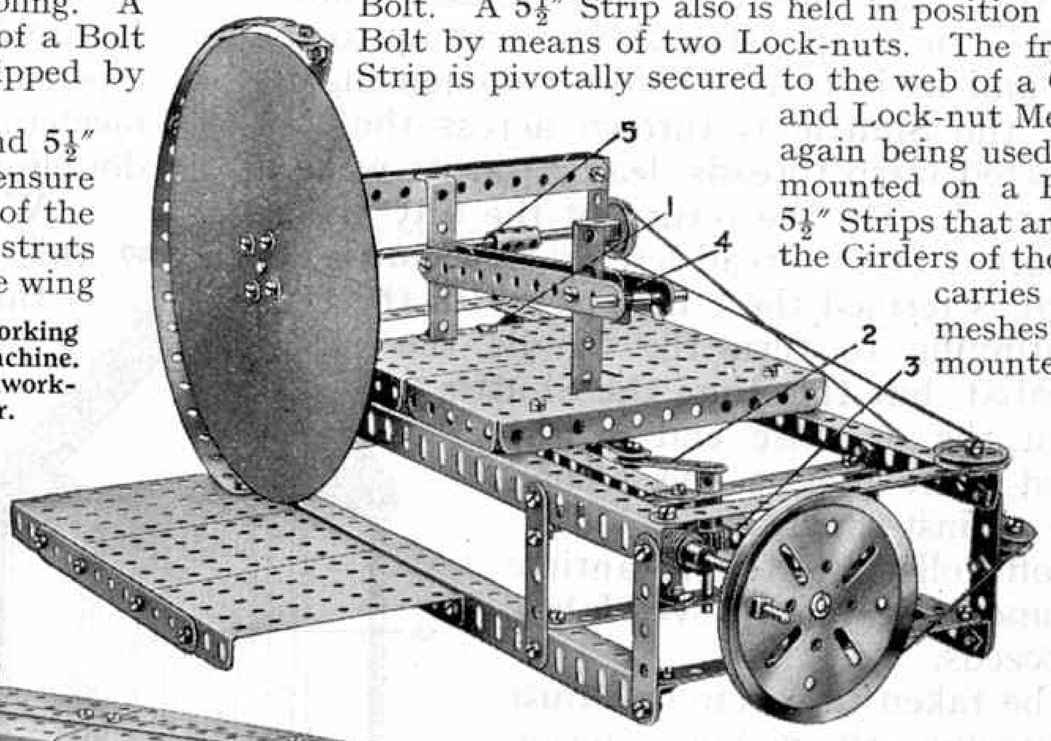
Bacon Slicing Machine

From a high speed fighter aeroplane we turn to a very different form of mechanism—a bacon slicing machine! The model shown in Fig. 2 incorporates the movements of the machine that is to be found in almost every provision store, although naturally it cannot be expected to deliver tempting rashers of "porker" in the same way as its prototype!

The frame of the model consists of two rectangular sections composed of 12½" Angle Girders and 5½" Strips. These frames are held apart one above the other by 2½" Strips. Three 3½" × 2½" Flanged Plates are secured to one of the lower 12½" Girders to form a tray. A 5½" Strip is bolted to the outside flanges of these Plates in order to keep them rigid.

The oscillating table, upon which the bacon to be sliced is secured, consists of two 5½" × 2½" Flanged Plates. Two 2½" × ½" Double Angle Strips are secured to the table, and these support the movable "gripper" that holds the bacon in position on the table. The gripper consists of two 5½" Strips spaced apart by means of two Double Angle Brackets and carrying a 1½" Axle 4 at one end to act as a handle. Four Reversed Angle Brackets are attached to the 5½" × 2½" Flanged Plates forming the table and these engage with the flanges of the upper pair of 12½" Angle Girders so that the table may slide backward and forward on the main framework.

A Pivot Bolt 1 is placed in the end centre hole of one of the 5½" × 2½" Flanged Plates forming the oscillating table, and a Collar is slipped on to the plain portion of the shank of the Pivot Bolt. A 5½" Strip also is held in position on the end of the Bolt by means of two Lock-nuts. The free end of the 5½" Strip is pivotally secured to the web of a Crank 2, the Bolt and Lock-nut Mechanism (SM263) again being used. The Crank 2 is mounted on a Rod journalled in 5½" Strips that are secured between the Girders of the frame. The Rod carries a ½" Pinion 3 that meshes with a Worm mounted on a second Rod. This Rod is journalled in bearings consisting of 1½" × ½" and a 2½" × ½" Double Angle Brackets. A 3" Pulley is fixed on the end of the Rod carrying the Worm to act as a flywheel, and a Threaded Pin is secured to the Pulley so that the mechanism may be rotated by hand.



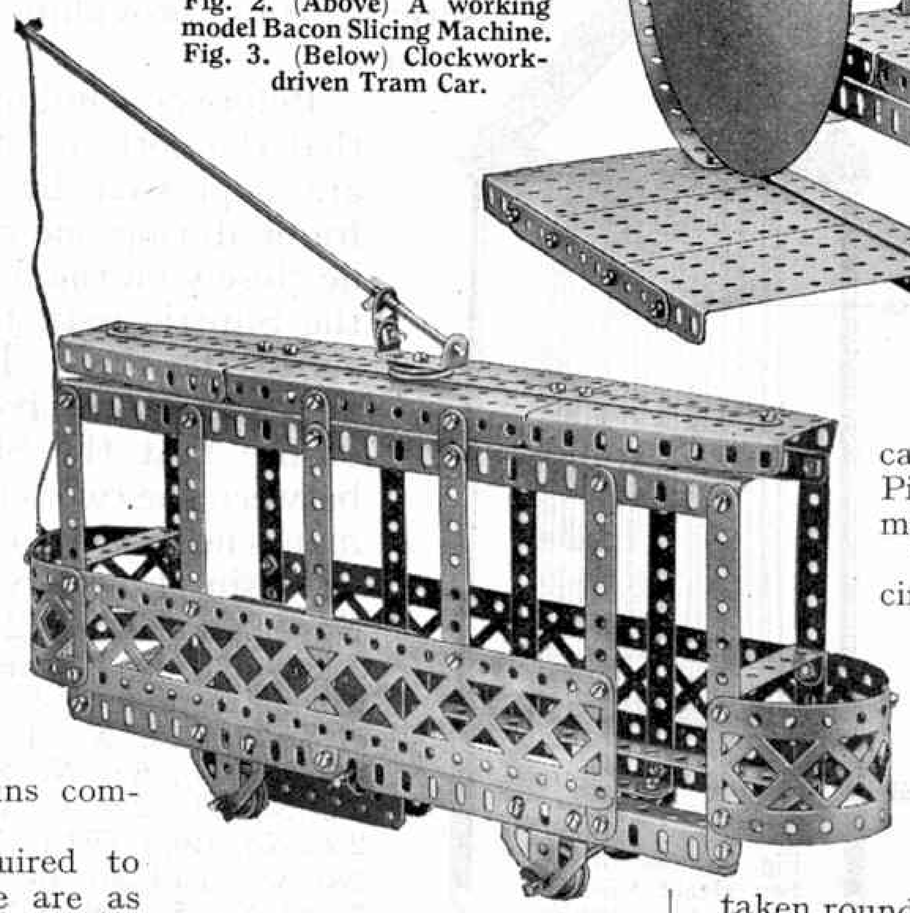


Fig. 2. (Above) A working model Bacon Slicing Machine.
Fig. 3. (Below) Clockwork-driven Tram Car.

The rotating knife of the machine is represented by a circle of stiff cardboard bolted to a Bush Wheel, which is secured to a composite Rod 5 mounted in a framework of Strips fixed to the main frame. The Rod 5 carries a 1" Fast Pulley at one end, and this Pulley is coupled to the 3" Pulley forming the hand wheel, by means of an endless length of Cord. The Cord is first passed round the groove of the 3" Pulley, and guided round 1" and ½" Loose Pulleys pivotally mounted on bearings secured to the frame. The Cord is finally taken round the 1" Fast Pulley on the knife shaft, thus completing the drive.

Parts used in the construction of this model are:—1 of No. 1;

14 of No. 2 ; 1 of No. 3 ; 1 of No. 4 ; 6 of No. 5 ; 4 of No. 8 ; 4 of No. 11 ; 7 of No. 12 ; 4 of No. 15a ; 1 of No. 16 ; 2 of No. 17 ; 1 of No. 18a ; 1 of No. 19b ; 1 of No. 22 ; 1 of No. 22a ; 1 of No. 23 ; 1 of No. 24 ; 1 of No. 26 ; 1 of No. 32 ; 2 of No. 35 ; 71 of No. 37 ; 14 of No. 37a ; 9 of No. 38 ; 1 of No. 40 ; 1 of No. 48 ; 2 of No. 48a ; 2 of No. 52 ; 3 of No. 53 ; 2 of No. 59 ; 1 of No. 62 ; 1 of No. 63 ; 1 of No. 111 ; 2 of No. 111c ; 1 of No. 115 ; 4 of No. 125 ; 1 of No. 126.

Tramway Car

In Fig. 3 is shown a model single-deck Electric Tram Car. The model is simple to build, and as a Clockwork Motor is fitted, the tram car will be found very interesting to operate, especially if rails are constructed from Angle Girders, etc., for the model to run on.

The frame or " chassis " of the model consists of two $12\frac{1}{2}''$ Angle Girders spaced apart by $2\frac{1}{2}''$ Strips. Six $5\frac{1}{2}''$ Strips are secured to the flanges of the Angle Girders, and these support two further $12\frac{1}{2}''$ Angle Girders that carry the roof. The roof itself is composed of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and two Sector Plates held together by means of a $12\frac{1}{2}''$ Strip. The roof is attached to the upper $12\frac{1}{2}''$ Girders by means of Flat Brackets.

The No. 1 Clockwork Motor is supported within the frame of the model by a $3\frac{1}{2}''$ Axle Rod fitted with Spring Clips. The standard axle of the Motor is removed, and a $3\frac{1}{2}''$ Axle Rod is substituted. This Axle is journalled in Flat Trunnions bolted to the Angle Girders forming the frame, and it carries two $\frac{3}{4}''$ Flanged Wheels. The front pair of road wheels are mounted on a $3\frac{1}{2}''$ Axle Rod journalled in Trunnions attached to the $12\frac{1}{2}''$ Angle Girders by means of Angle Brackets.

In order to build the model Tram Car the following parts will be needed :—1 of No. 1 ; 10 of No. 2 ; 2 of No. 3 ; 2 of No. 5 ; 4 of No. 8 ; 5 of No. 10 ; 4 of No. 12 ; 1 of No. 13 ; 3 of No. 16 ; 4 of No. 20b ; 1 of No. 22a ; 4 of No. 35 ; 60 of No. 37 ; 2 of No. 37a ; 5 of No. 38 ; 1 of No. 48 ; 2 of No. 48a ; 1 of No. 52 ; 2 of No. 54 ; 2 of No. 99 ; 2 of No. 100 ; 2 of No. 111c ; 2 of No. 126 ; 2 of No. 126a ; 1 No. 1 Clockwork Motor.

Trench Shovel

The model shown in Fig. 4 represents a Trench Shovel, a machine that is used in sinking pipe lines, cutting ditches, and in similar types of excavation work. The machine differs from the normal type of bucket excavator in that the digger bucket is drawn inward on the power or cutting stroke, instead of being hauled outward as is the case with the usual type. The arm of the shovel operates at a fixed radius, whereas the arm of the standard type of excavator shovel is generally capable of adjustment on the well known rack-and-pinion principle (see for example the Meccano Steam Shovel, Super Model No. 19).

The Clockwork Motor forms the base of the swivelling superstructure of the model. Two $5\frac{1}{2}''$ Angle Girders are bolted to the upper side plate of the Motor, and a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate is secured in position, as can be seen in Fig. 4, to extend the base. It will be noticed that a strip of lead is attached to the underside of the Flanged Plate in order to balance the jib and bucket. The strip is approximately 1" wide, and is secured to the Flanged Plate by means of two $\frac{3}{4}''$ Bolts.

The jib of the crane consists of two " U " Girders built up from four $12\frac{1}{2}''$ Angle Girders and spaced apart by means of $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Brackets. A $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is secured to the front edge of the side plate of the Motor and a 2" Rod is passed through the end holes of the " U " Girders, thus enabling the jib to pivot ; the Rod is held in place by means of Spring Clips.

A Sector Plate is bolted on each side of the swivelling superstructure to form the sides of the gear-box.

A Worm is mounted on the driving spindle of the Clockwork Motor. Two $\frac{1}{2}''$ Pinions 1 and 2 are mounted on $4\frac{1}{2}''$ Axle Rods in the side plates of the gear-box. These Pinions are arranged so that either may be brought into gear by operating the pivoted gear lever, which consists of a $5\frac{1}{2}''$ Strip pivoted close to one end on a Bolt secured to an Angle Bracket bolted to one of the side plates of the gear-box. Spring Clips and Washers are placed on the Rods on each side of the pivoted Strip, so that when the Strip is moved the Rods carrying the Pinions 1 and 2 are pushed from side to side in the gear-box, thereby bringing the Pinions into engagement with the Worm.

A 5" Rod is mounted in the gear-box side plates, and this carries a 57-teeth Gear 3. The Pinion 2 should be arranged so that it may be brought into engagement with the Worm, and by a further movement to mesh also with the 57-teeth Gear 3. A length of Cord is wound round the free end of the 5" Rod carrying the Gear 3, The ends of the Cord are then passed round a horizontal guide Rod mounted in Angle Brackets at the side of the gear-box, and the Cords are finally taken round a 3" Pulley secured to the travelling base of the model ; the ends of the Cord are then tied so as to form an endless belt.

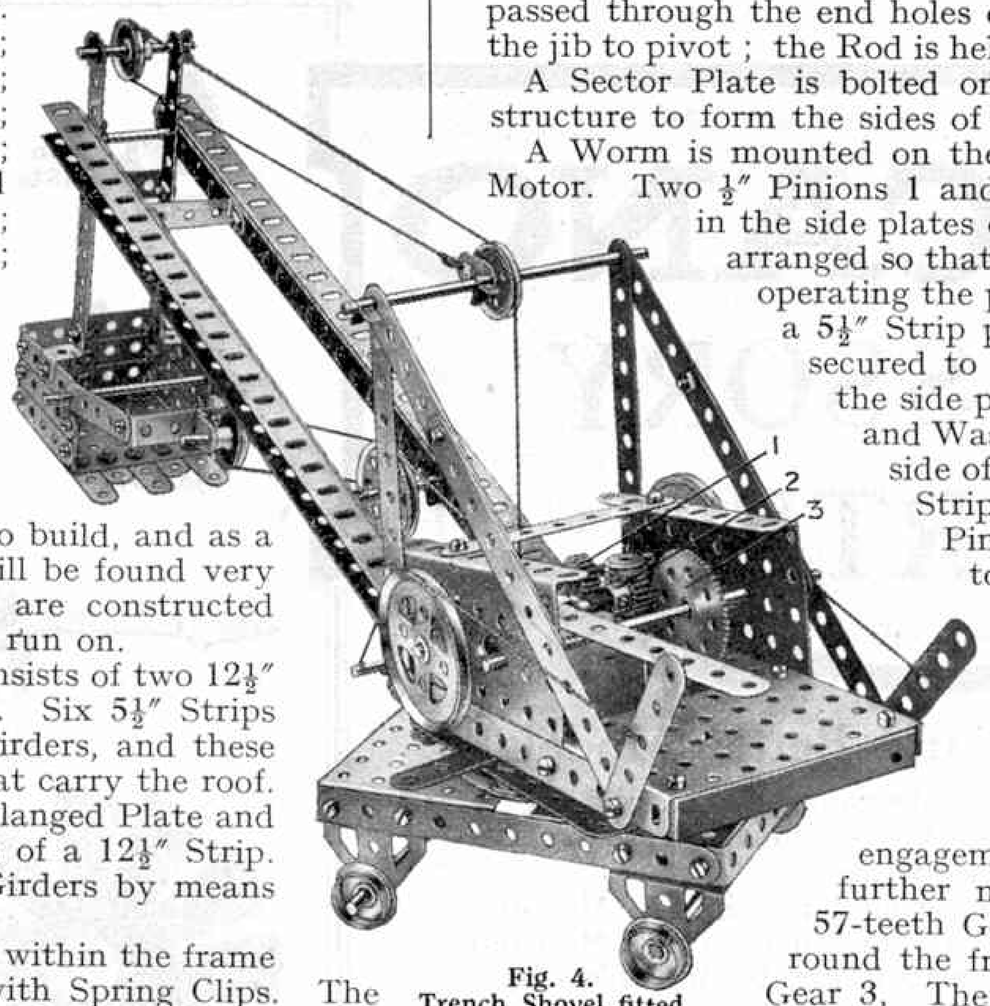


Fig. 4. Trench Shovel fitted with digging and swivelling motions.

The swivelling superstructure is pivoted to the travelling base by means of a Pivot Bolt mounted in an " H " frame composed of two $3\frac{1}{2}''$ and one $2\frac{1}{2}''$ Strips. This " H " frame is spaced away from the lower side plate of the Clockwork Motor by means of Washers, so as to provide room for the head of the Pivot Bolt.

The Trench Shovel contains the following parts :—13 of No. 2 ; 2 of No. 4 ; 14 of No. 5 ; 2 of No. 6a ; 4 of No. 10 ; 6 of No. 12 ; 2 of No. 15 ; 3 of No. 15a ; 2 of No. 16 ; 2 of No. 17 ; 4 of No. 18a ; 1 of No. 19b ; 2 of No. 20a ; 1 of No. 21 ; 2 of No. 22 ; 1 of No. 22a ; 2 of No. 26 ; 1 of No. 27a ; 1 of No. 32 ; 14 of No. 35 ; 94 of No. 37 ; 6 of No. 37a ; 8 of No. 38 ; 2 of No. 40 ; 1 of No. 44 ; 1 of No. 46 ; 2 of No. 48 ; 4 of No. 48a ; 2 of No. 48b ; 3 of No. 53 ; 2 of No. 54 ; 1 of No. 59 ; 1 of No. 63 ; 6 of No. 111c ; 2 of No. 125 ; 2 of No. 126 ; 2 of No. 126a ; 1 of No. 147b ; 1 No. 2 Clockwork Motor.

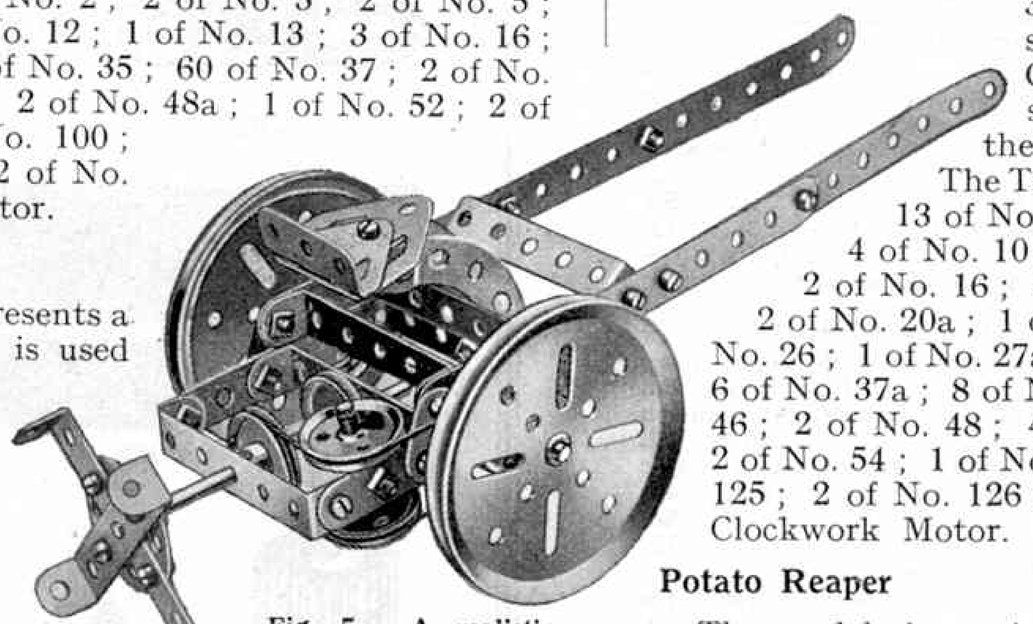


Fig. 5. A realistic Potato Reaper with revolving blades.

Potato Reaper

The model shown in Fig. 5 represents a machine that is used extensively by farmers for gathering the potato crop. The machine is drawn forward by a horse, and the wheels cause the mechanical forks to rotate, thus turning over the ground and exposing the potatoes.

The frame of the model is built up from two $3\frac{1}{2}''$ Strips and $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. A third Double Angle Strip is secured inside the frame to form a support for the Rod carrying the rotating forks. A 1" Fast Pulley is mounted on the axle of the machine, and an endless length of Cord is passed round this Pulley, over two Guide Pulleys, and round a second 1" Fast Pulley mounted on the shaft carrying the rotating forks. The driver's seat consists of a Trunnion and a Flat Trunnion bolted together and secured to a $2\frac{1}{2}''$ Curved Strip by means of an Angle Bracket. A further Angle Bracket holds the Curved Strip to the frame of the model.

In order to build the Potato Reaper the following parts will be required ;—4 of No. 2 ; 2 of No. 3 ; 4 of No. 10 ; 3 of No. 11 ; 1 of No. 15a ; 1 of No. 16 ; 1 of No. 18a ; 2 of No. 19b ; 4 of No. 22 ; 2 of No. 22a ; 1 of No. 24 ; 2 of No. 35 ; 28 of No. 37 ; 6 of No. 38 ; 1 of No. 40 ; 8 of No. 48a ; 2 of No. 90a ; 1 of No. 126 ; 1 of No. 126a. A Meccano Horse may be built for the Potato Reaper.

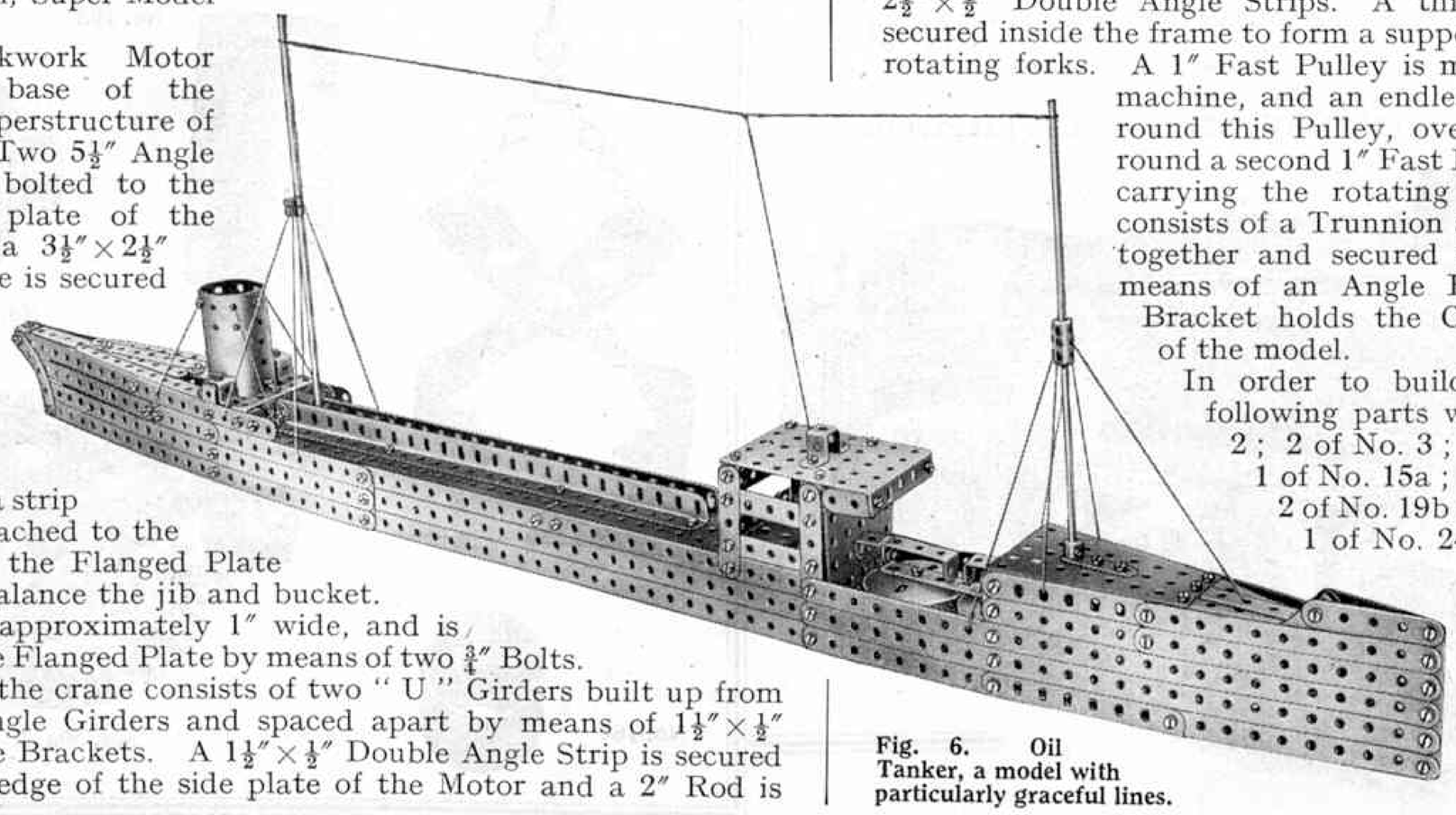


Fig. 6. Oil Tanker, a model with particularly graceful lines.

(*Continued on page 314*)

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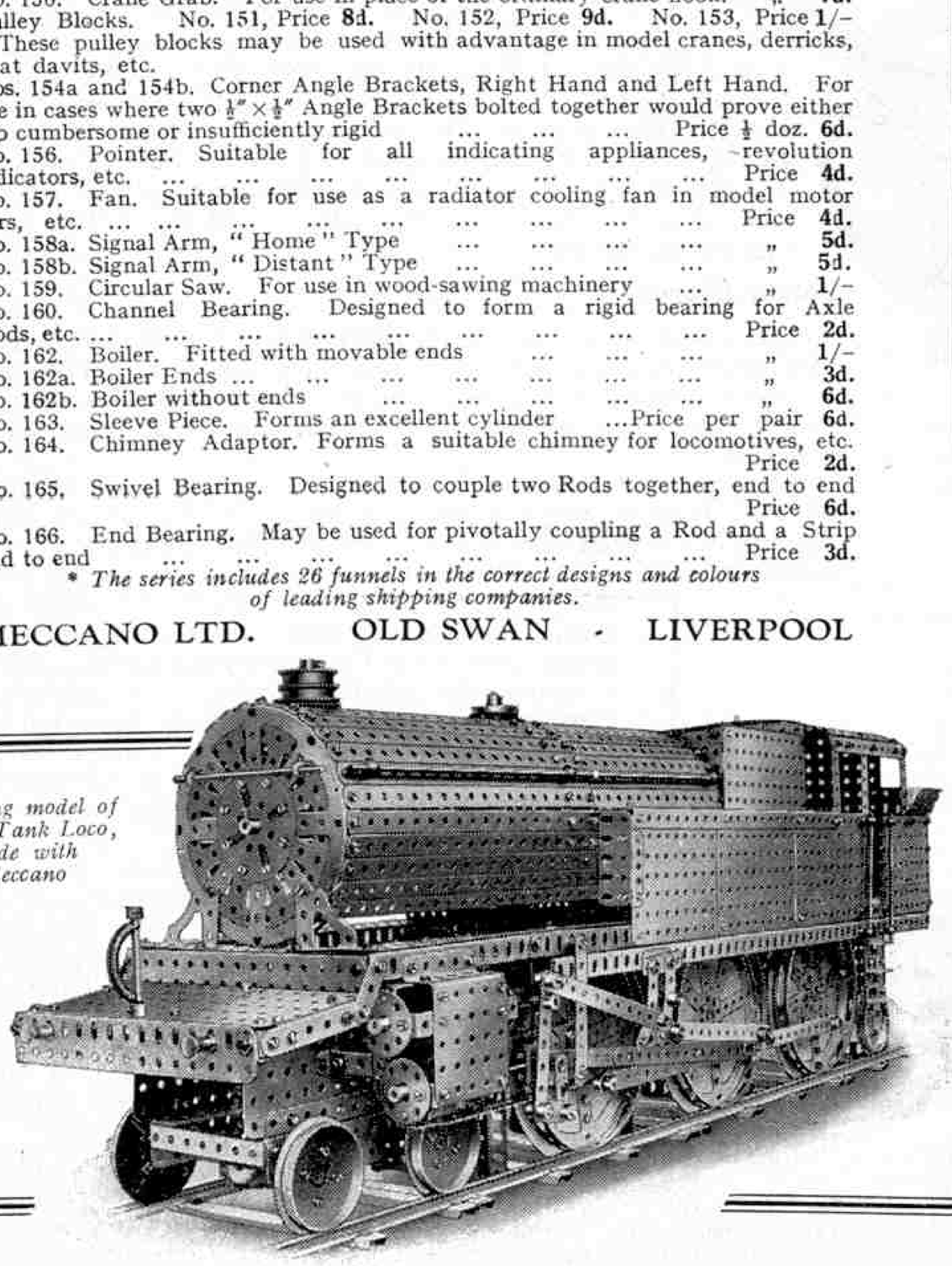
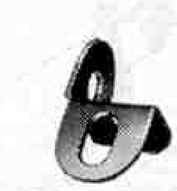


Working model of Baltic Tank Loco, made with Meccano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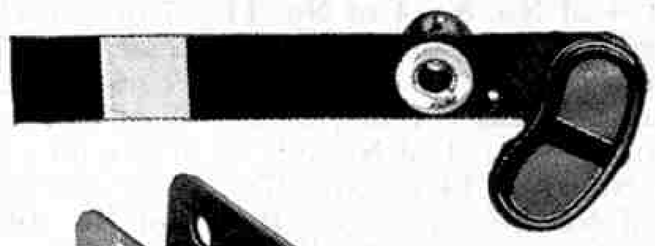
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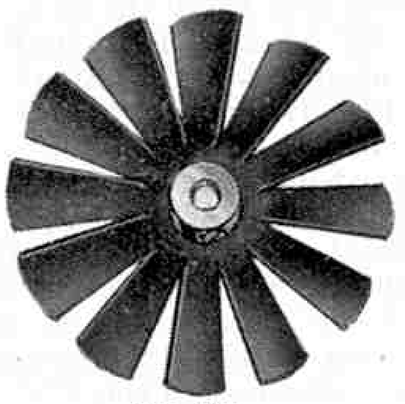
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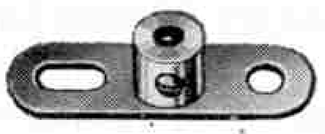
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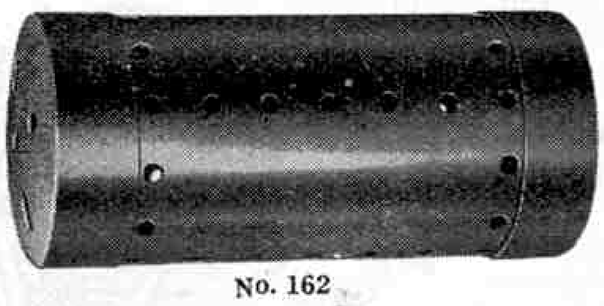
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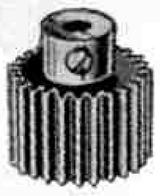
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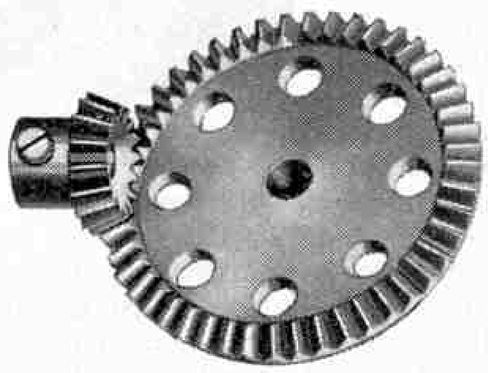
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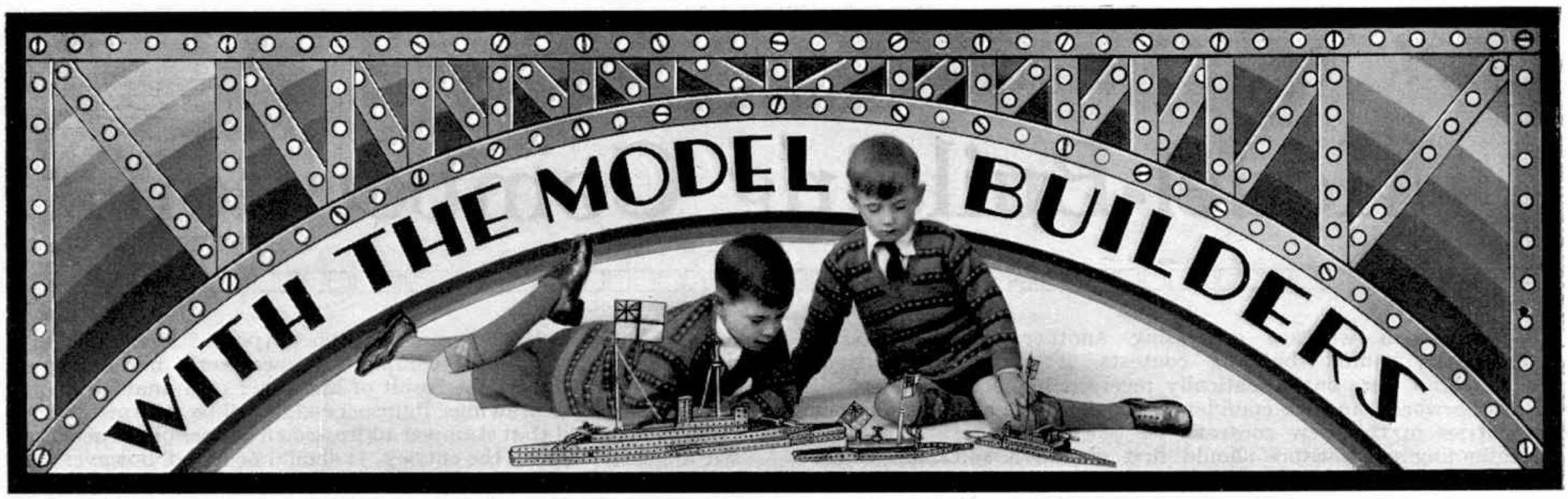


PROPELLER CYCLE MASCOTS

Those Meccano model-builders who are also cycling enthusiasts will be interested in the handle-bar mascots illustrated on this page, and many will no doubt be keen to fit them to their machines.

The mascots make use of the Meccano Aero Constructor parts, and model-builders who are the lucky owners of the larger Aero Constructor Outfit will have most of the parts with which to build the mascots.

The mascots shown in the illustration are designed to fit on to the handle-bars of a standard cycle, but they can be fitted to other portions of the machine, such as the front mudguard, crown tube, etc., by suitably modifying the form of fitting.

The left-hand mascot makes use of the Large Radial Engine (Aero Part No. P46) and the Large Propeller (Aero Part No. P34); while the other mascot employs the Small Radial Engine (Aero Part No. P43), and the Small Propeller (Aero Part No. P35). Both mascots look very effective when mounted in position, although the larger type naturally presents the more imposing appearance. When the cycle is in motion the Propeller rotates rapidly in a most realistic manner.

An identical method of assembly is used for both mascots. A Centre Section Strut 1 (Aero Part No. P29) is first of all secured to the screwed spindle of the Radial Engine by means of a nut, a Washer being used so that the spindle does not slide in the slotted hole in the Strut. A ¾" Bolt is passed through the round hole of the right-angled lug of the Strut and the Bolt is also passed through the end hole of a Meccano 2" Strip 2. A Nut 3 is then screwed on to the shank of the Bolt and locked tightly so that the Strut 1 and the Strip 2 are held firmly together. The 2" Strip 2 should be bent into the form of a semi-circle at its centre so that it will fit closely round the handle-bar.

A second 2" Strip 4 should next be bent so that it fits closely to the underside of the tube. The ¾" Bolt is passed through the end hole in the Strip 4 and a second Nut is placed on the Bolt so that the Strips can be clamped together round the tube. A second ¾" Bolt, fitted with Nut, is used to hold the free ends of the 2" Strips together.

The Propeller is held in place on the smooth portion of the engine spindle by means of two Lock-nuts. The Nuts should be screwed on to the short screwed section, and then rotated in opposite directions by means of two Spanners so that they lock tightly together. The blades of the Propeller should be twisted slightly to increase their "pitch."

The fitting of the mascot to the handle-bars is merely a matter of placing the 2" Strips round the bar and screwing up the ¾" Bolts so that the Strips grip the bar securely. All Bolts should be screwed up very tightly so as to prevent loosening due to vibration. If necessary Lock-nuts may be employed at each point.

KNIFE-EDGE BEARING

Many readers will know that knife-edge bearings, consisting of agate and steel bearing pieces, are used in balances, measuring instruments and other scientific apparatus where extreme accuracy is required. The knife-edge bearing has a very low friction factor, and consequently enables extremely sensitive adjustments to be made.

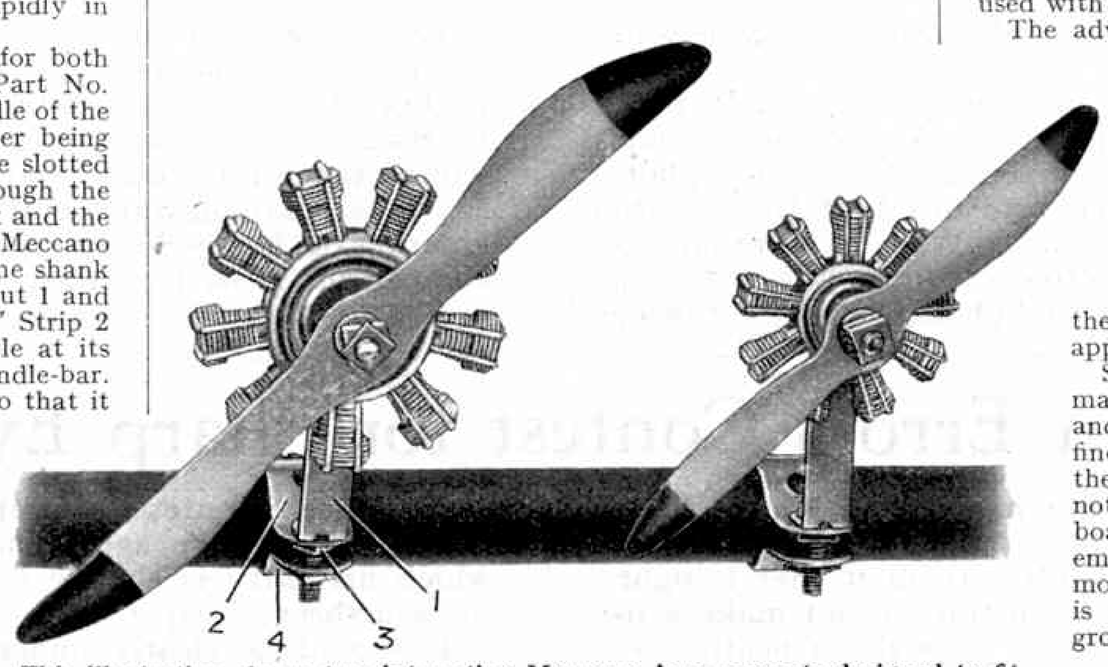
Several constructors have suggested that an equivalent of this type of bearing should be introduced into the Meccano system, so that balances and various types of scientific instruments having a high standard of accuracy could be constructed. These builders will be interested to know that a knife-edge bearing can at present be reproduced using standard Meccano parts, and the bearing is actually used in several well-known Meccano models.

The bearing consists essentially of a Meccano Centre Fork (part No. 65) that is secured to the movable portion of the model, and whose teeth rest in one of the grooves of a Meccano ½" Pinion. The Meccano Centre Fork is specially hardened so that, although the area of contact between the bearing surfaces is remarkably small, excessive wear does not take place. This type of bearing is made use of in the Meccano Platform Scales (Super Model No. 7) and also in the Harmonograph (Super Model No. 26), where two sets of these "knife edges" are employed to pivot the oscillating table.

SECURING THE BEST RESULTS FROM THE STEAM ENGINE

The Meccano Steam Engine is one of the most fascinating of the Meccano power units, and if carefully adjusted it is capable of supplying a remarkable amount of power. To obtain the best results, however, it is necessary to see that the working parts are running freely and that there is no loss of steam between the boiler and the cylinder, so that all the available energy is utilised.

Power is sometimes lost owing to the gauge cock not being completely steamtight. A leak at this point may usually be rectified by fitting a new washer, but sometimes the tap plug itself is the cause of the trouble. In this case the plug should be removed and a little emery powder or grinding paste placed on its coned surface. The plug should then be replaced and worked backward and forward so that the surfaces are bedded down and a steam-tight joint results. After grinding the surfaces, the plug should be wiped clean and secured once more in position.



This illustration shows two interesting Meccano Aero mascots designed to fit to the handle-bars of a bicycle. When the cycle is in motion the Propellers rotate in a most realistic manner. The mascots are described in the accompanying paragraph.

Incorrect adjustment of the safety valve may result in unnecessary loss of power. If the valve "blows off" too easily, it should be removed from the boiler and the small lock-nuts screwed up on the threaded spindle so that the valve spring is compressed. A leak at the threaded portion of the safety valve may be rectified by fitting a new washer.

Loss of steam between the face of the reversing block and the reversing lever may be corrected by screwing up the bolt holding the small flat spring in place. If this does not have the desired effect, a new spring may be substituted. If the leak at this point is due to the surfaces not being completely true, then the trouble may be rectified by applying emery powder or grinding paste to the face of the reversing lever and working the lever backward and forward so that the faces are ground true.

In the case of the oscillating cylinder an excessive loss of steam may be caused through the pivot spring at the rear of the valve block being too slack. The spring may be compressed by turning the small retaining nut on the screwed end of the pivot rod; or if this adjustment does not produce sufficient tension, packing washers may be employed. Although the cylinder should be held in close contact with the valve face, there must not be excessive compression or power will be lost due to friction. A little experiment will soon result in the best adjustment being obtained.

In order to obtain the maximum efficiency from the Engine it must be adequately lubricated. Lubricant should be applied to the valve face and piston, while the crank shaft bearings should also be adequately oiled. The piston and cylinder wall may be oiled by means of an automatic lubricator similar to that described in the "Suggestions Section" for December 1930.

THE MECCANO AERO MOTORS

Just as a Meccano Clockwork Motor increases the enjoyment to be obtained from a standard Meccano Outfit, so the Meccano Aero Clockwork Motors increase the attraction of the aeroplane models that can be built with the Meccano Aero Constructor Outfits.

We have received enquiries from readers who wish to add the Aero Motors to their Constructor Outfits, and a few notes on the use of these Motors will consequently be helpful.

In the first place, some constructors apparently think that the No. 1 Aero Motor can be used only with a No. 1 Aero Constructor Set, and that the No. 2 Motor is only suitable for use in the models built with a No. 2 Set. This is not the case, however. The No. 1 and the No. 2 Aero Motors are interchangeable; that is, each can be used with models built with either Set.

The advantage of the No. 2 Motor is that it incorporates a double drive, so that the landing wheels are rotated at the same time as the Propeller. The No. 1 Motor enables the Propeller only to be rotated. The No. 2 Motor consequently enables a more realistic effect to be obtained, as the model can be made to taxi along the ground with its Propeller revolving. Obviously, however, the No. 2 Motor is not suitable for use in models of seaplanes and flying boats, and in these models the No. 1 Motor forms the appropriate driving unit.

Seaplanes, flying boats and amphibian machines may be constructed with a No. 2 Set, and the owner of a No. 2 Outfit will therefore find both the No. 1 and No. 2 Motors of use in the models he builds. The No. 1 Outfit does not include any models of seaplanes or flying boats, and the No. 2 Motor can therefore be employed to advantage in all the No. 1 Outfit models, the No. 1 Motor being employed if it is not desired to drive the models along the ground.

FOUR-BLADED PROPELLER.—We were interested in your suggestion that a four-bladed Propeller should be added to the range of Meccano Aero Constructor parts. A Propeller of this type might be used in several models of large machines, but we would point out to you that propellers of this type are very rarely fitted to present-day aircraft, and the application of your suggested part would therefore be very limited. In cases where a propeller is fitted to a model in which an engine of the "water-cooled" type is represented, you can obtain the effect of a four-bladed Aero Screw by mounting two propellers at right-angles, with their bosses outward; but where a Radial Engine is included it is of course impossible to do this. We are keeping your idea in mind for further reference. (*Reply to H. H. Brown, Derby.*)

PLIABLE PLATES.—Plates made of thin metal that could be bent easily to any desired shape would be useful in certain types of constructional work. Your idea would be to supply the plates with perforations around the edges only, so that the parts would provide a plain surface when used for covering-in large frameworks. The drawback to these parts is that their utility would be seriously handicapped owing to the relatively few number of points at which they could be attached. The idea of special covering material presents distinct possibilities, however, and your suggestion will receive careful attention. (*Reply to F. H. Parkes, Peacehaven.*)

NEW GEAR WHEELS.—A range of Gear Wheels and Pinions having teeth placed at intervals around their edges, could be employed in the construction of intermittent motion mechanisms. The application of these Gears would be limited. Several types of intermittent gearing may be constructed using the Standard Meccano Wheels. (*Reply to Brian Hollins, Grays.*)

"Simplicity" Model-Building Competition

This month we are organising another of the popular "Simplicity" model-building contests. Previous competitions of this kind were enthusiastically received by model-builders all over the world, and we confidently expect a tremendous number of entries in this new contest.

Intending competitors should first choose a suitable subject and then set to work and reproduce it in Meccano, *using the smallest number of parts consistent with a realistic effect.* Models of any kind may be submitted.

It must not be imagined that in this Contest competitors are restricted to a limited quantity of parts. Any number or variety of parts may be used, but the prizes will be awarded to those competitors who succeed in constructing the most ingenious models with the smallest number of parts. Neither should it be thought that the Contest is only for the owners of small Outfits. It is quite possible to employ in the construction of even the most simple models and mechanisms many Meccano accessories such as Cranks, Gear Wheels, Couplings, etc., that are not contained in the smaller Outfits. The competitor who submits the smallest model will not necessarily obtain the first prize.

When the model is completed it is only necessary to send either a photograph or a drawing of it to this office. A good photograph is preferable to a drawing, but if it is impossible to obtain a photograph, a drawing will do quite well provided that the essential features of the model are clearly indicated. We must mention here, however, that competitors who wish to see their models, if successful, illustrated in the "*M.M.*," must send photographs, as drawings of models are useless for reproduction purposes. Photographs or drawings need not be the competitor's own work, but the model itself must be entirely the result of his or her own unaided efforts.

Photographs or drawings, if unsuccessful, will be returned to competitors provided that stamped addressed envelopes of the necessary size are enclosed with the entries. It should be noted, however, that photographs of prize-winning models become the property of Meccano Ltd. More than one model may be entered in the Competition, but all entries from any single competitor must be sent under the same cover.

It is usually advisable to submit a short description of the model, although in the case of a very simple model this may not be necessary.

No entry form is needed, but competitors must take special care to see that their name, address and age are clearly written on the back of each sheet of paper or photograph submitted, and also the letter A, B or C indicating the Section in which the model is to be entered. Envelopes containing entries should be addressed to Fifth "Simplicity" Contest, Meccano Ltd., Binns Road, Old Swan, Liverpool.

The Prizes

Sections A and C

First Prize : Meccano or Hornby Train goods value £3-3s.
Second Prize : Meccano or Hornby Train goods value £2-2s.
Third Prize : Meccano or Hornby Train goods value £1-1s.
Five Prizes of Meccano or Hornby Train goods value 10/6.
Twenty Engineer's Pocket Books and Certificates of Merit.

Section B

Two First Prizes of Meccano or Hornby Train goods value £1-1s.
Two Second Prizes of Meccano or Hornby Train goods value 15/–.
Two Third Prizes of Meccano or Hornby Train goods value 10/6.
Five Prizes of Meccano or Hornby Train goods value 5/–.
Five Prizes of "How to Use Meccano Parts" Manuals.
Twenty Engineer's Pocket Books and Certificates of Merit.

Entries will be divided into three Sections as follows:—Section A, for competitors over 14 years living in the British Isles. Section B, for those under 14 living in the British Isles. Section C, for readers of all ages residing Overseas. The age of each competitor will be taken into consideration when judging the models.

The last day on which entries will be received from competitors entering the Home Sections (A and B) is 31st May, 1932. Overseas competitors must post their entries so that they reach Liverpool not later than 31st August, 1932.

An Errors Contest for Sharp Eyes

What is wrong with the Meccano model ship shown here? A glance will show that many mistakes have been made in its construction; in fact there is very little about it that is right! Readers are invited to examine the illustration and make a list of all the errors they can find, and set them down neatly on a sheet of paper. Most of the mistakes are so obvious that even the youngest competitors should be able to recognise them without difficulty, but some have to be looked for carefully. Lists of errors should be written in column form on one side only of a sheet of ruled paper.

The contest will be divided into Section A, for competitors between 12 and 16 years living in the British Isles; Section B, for competitors under 12 living in the British Isles; Section C, for all competitors under 16 living Overseas.

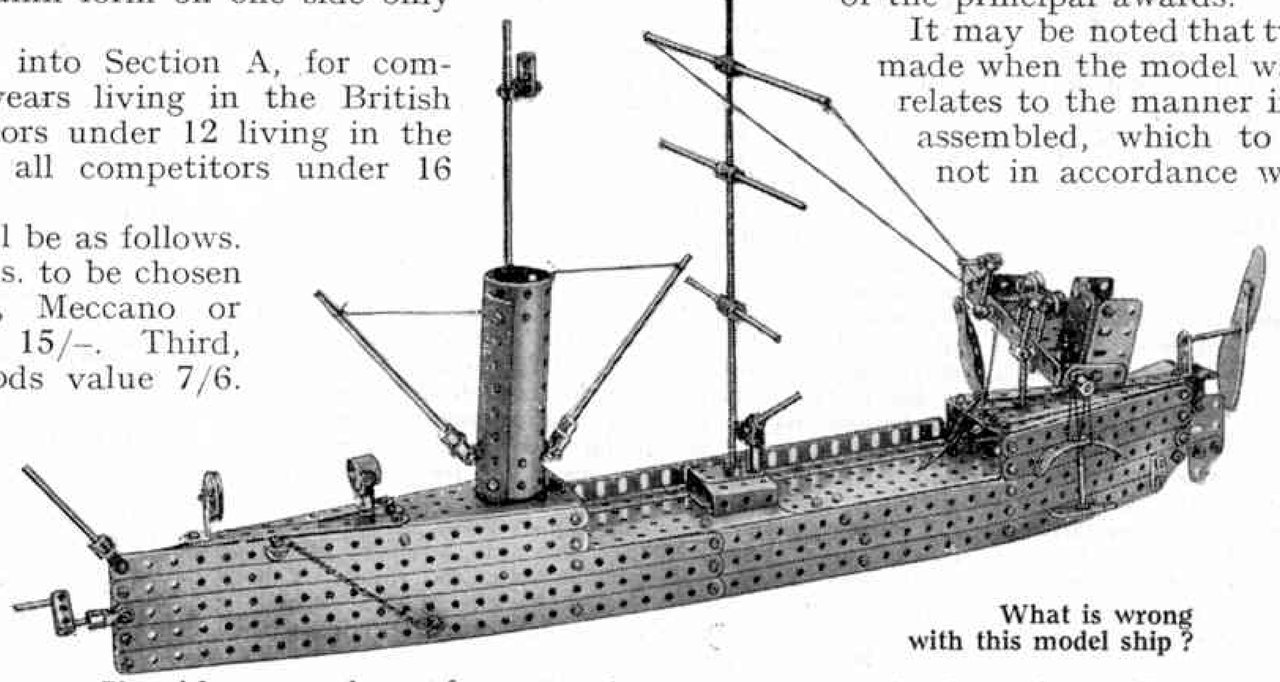
The prizes in each Section will be as follows. First, Meccano goods value £1-1s. to be chosen by the competitor. Second, Meccano or Hornby Train goods value 15/–. Third, Meccano or Hornby Train goods value 7/6. There will also be a number of consolation prizes.

If no single competitor succeeds in pointing out every mistake in the model the First Prize in each Section will of course be awarded to the competitor or competitors who submit the largest lists of errors. Should a number of competitors succeed in pointing out all the mistakes included in the model, the judges will give preference to those entries that put forward the most simple alternative methods of construction.

Sections A and B will close for entries on 31st May, 1932. Closing date for Section C, 31st August, 1932. Entries should be forwarded to "Errors" Contest, Meccano Ltd., Binns Road, Liverpool.

The competitor's age, name and address and the Section for which his entry is eligible must be written clearly on the back of each sheet of paper sent.

It should be clearly understood that to enter this Contest a Competitor need not be an expert essayist; any boy who "spots" the most mistakes and sets down his criticisms in a clear and precise manner stands a very good chance of obtaining one of the principal awards.



What is wrong with this model ship?

It may be noted that two distinct types of error were made when the model was constructed, the first type relates to the manner in which the parts have been assembled, which to say the least is certainly not in accordance with good Meccano practice! The second type of error concerns the design of the model. Any boy who is familiar with the appearance of a steam ship will soon discover a mistake of this kind.

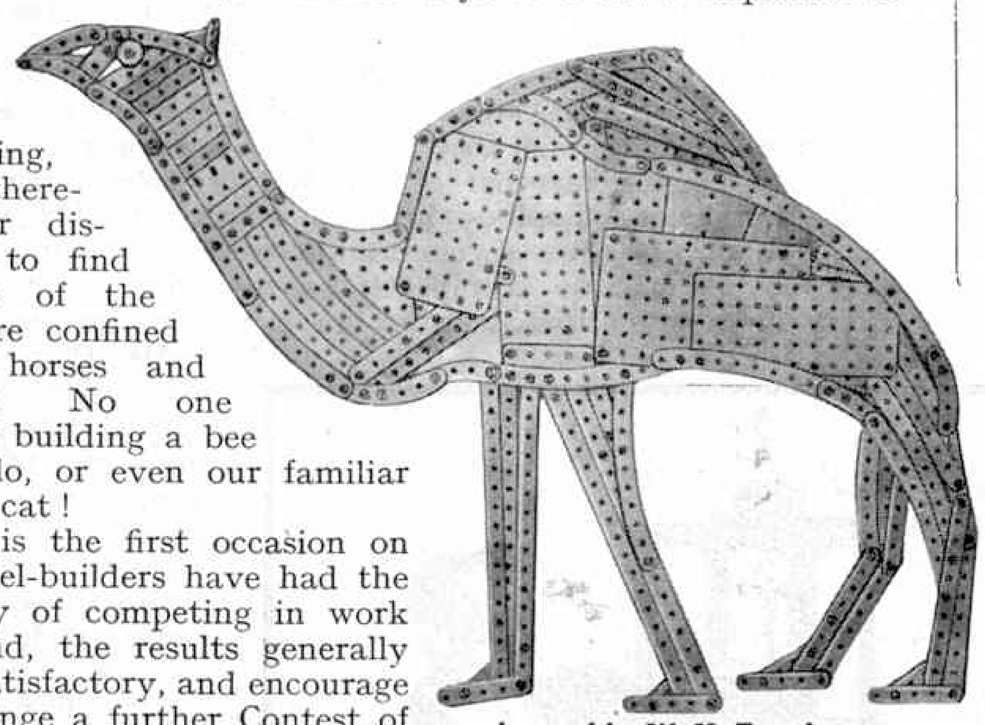
There is no doubt that many boys will be able to discover all the mistakes readily if they build up the actual model for themselves, but we may say that it is possible to discover every mistake quite easily from the illustration. In preparing their lists competitors will probably find the complete Meccano Instructions Manual of great help, for in it are illustrated several models of ships that are built on correct principles. By comparing the model shown here with those in the Manual many of the errors will be immediately apparent.

Results of Meccano Model-Building Contests

By Frank Hornby

"Birds and Beasts" Contest (Home Section)

WHEN the "Birds and Beasts" Competition was announced I was quite sure that the construction of animals in Meccano would prove a very fascinating pastime, and also would be a good test of competitors' ingenuity in using the standard parts. My surmise was correct, for many of the entries display remarkable constructional skill, and some really good results have been obtained. Knowing Meccano boys as I do, I expected to receive models of every kind of living thing, and I was therefore rather disappointed to find that most of the models were confined to dogs, horses and kangaroos! No one thought of building a bee or a buffalo, or even our familiar friend the cat!



A camel by W. H. Temple.

As this is the first occasion on which model-builders have had the opportunity of competing in work of this kind, the results generally are quite satisfactory, and encourage me to arrange a further Contest of the same type. I advise all those who entered this Competition to set to work on new models of animals immediately, so that they will have plenty of time to revise and rebuild them if necessary.

I regret to say that in this Contest very few competitors submitted photographs of their models, and I am therefore unable to illustrate them in the "*M.M.*" This is a great pity, because of the unusual interest of many of the entries. Drawings are quite satisfactory so far as judging is concerned, but competitors who wish to have their models illustrated must send good photographs, as drawings are useless for reproduction in the "*M.M.*" The winning competitors in the Home Section are as follows:—

Section A (for competitors living in the British Isles).

FIRST PRIZE, Meccano or Hornby Train goods value £3-3s.: W. R. H. Temple, Greenock. SECOND PRIZE, Meccano or Hornby Train goods value £2-2s.: John Macken, Bromley, Kent. THIRD PRIZE, Meccano or Hornby Train goods value £1-1s.: A. W. Shaw, Stalybridge, Cheshire.

SIX PRIZES of Meccano or Hornby Train goods value 7/6: F. Hoskins, Southampton; D. Francis, London, S.E.26; F. Thornton, Scarborough; N. Roberts, Dudley, Worcs.; Miss Margaret Noyes, Bishops Stortford, Herts.; J. Mears, London, S W.17.

ONE SPECIAL PRIZE of Meccano or Hornby Train goods value 5/-: D. Winder, Liverpool.

SIX PRIZES of Complete Instruction Manuals: A. Pugh, Littleworth, Faringdon; L. Bearne, Grantham; F. Drane, Twickenham, Middx.; K. Greaves, Folkingham, Lincs.; W. Cavanagh, Offaly, Ireland; S. Ettinger, Meadows, Nottingham.

SIX PRIZES of Meccano Engineer's Pocket Books and Certificates of Merit: H. Walsh, Kilmacow, Co. Kilkenny, Ireland; E. Metcalf, Portsmouth; C. Purnell, London, S.E.20; P. Weeks, Thornton Heath, Surrey; J. Naughton, Edinburgh; B. Shorten, Cork, Ireland.

Of all animals, that which formed the prototype of the First Prize model is perhaps the most difficult to reproduce in Meccano. We have all heard of the camel's "hump," but I imagine that few of us have ever tried to build one in Meccano! W. H. Temple, the First Prize winner, attempted the task and has produced an excellent model. As will be seen from the illustration here the model represents a camel of the dromedary species, which as many readers will know, is a native of Arabia. Dromedaries have only one hump, and are quite distinct from the African or Bactrian species, which is double humped.

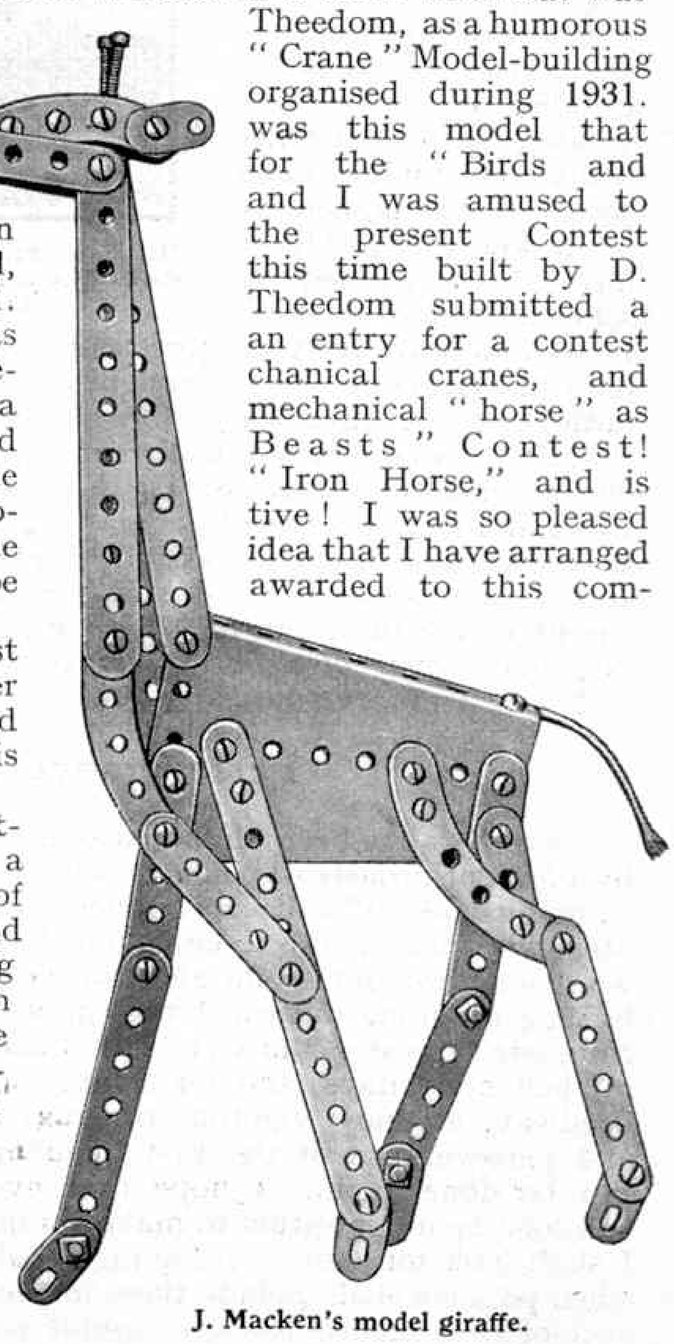
The great difficulty in building a model of this kind lies in reproducing exactly the irregularity of the curves in the outline of the body. By very careful planning, and working to a sufficiently large scale, much of the difficulty is overcome. Another problem is the filling in of the body, either by means of Plates or Strips. Here again large-scale working is helpful, as it gives more scope for rounding off sharp corners by means of various Curved Strips.

I think readers will agree that, in view of the difficulties involved in building a camel, Temple has done very well indeed.

Most readers of the "*M.M.*" will have visited a Zoo and roared with laughter at the antics of the monkeys, or been thrilled while watching the lions feed. But the Zoo animal that most astonishes the young visitor is the giraffe. J. Macken chose one of these long-necked creatures as the subject of his model in this contest, and built the fine African giraffe illustrated on this page. It will be seen that a Sector Plate is used effectively for the body, and Strips for the legs. The graceful, elongated neck is admirably reproduced.

A kangaroo formed the subject of A. Shaw's Third Prize model. It may interest the model-builder who is also fond of natural history to know that there are 56 different species of these animals in Australia, to which country they are entirely confined. Some of the largest male kangaroos stand 6 ft. or 7 ft. in height, and they can travel over the ground by tremendous leaps or "hops" of 10 ft. to 20 ft.! The thing that struck me most about Shaw's model is the almost pathetic "expression" on the animal's face, which, by the way, is composed of two $1\frac{1}{2}$" Strips with a Flat Bracket for the top of the head. Flat Brackets also form the ears. The curved outline of the abdomen and back are carried out by means of Curved Strips, and the sides of the body are neatly filled in with short Strips bolted to the Curved Strips. The long tail is represented by a $2\frac{1}{2}$" Curved Strip and a $3\frac{1}{2}$" Strip.

It will be remembered that in the announcement of the "Birds and Beasts" Contest, which appeared in the December 1931 "*M.M.*," mention was made of a model of a crane bird that was submitted by D. A. Theedom, as a humorous entry in the "Crane" Model-building Competition organised during 1931. Incidentally it was this model that suggested the idea for the "Birds and Beasts" Contest, and I was amused to find among the entries in the present Contest another humorous model, this time built by D. Winder, of Liverpool. Theedom submitted a non-mechanical "crane" as an entry for a contest devoted to models of mechanical cranes, and Winder hit on the idea of a mechanical "horse" as an entry for the "Birds and Beasts" Contest! Winder's model is called the "Iron Horse," and is really an old-time locomotive! I was so pleased with the ingenuity of the idea that I have arranged for a special prize to be awarded to this competitor.



J. Macken's model giraffe.

Other models of interest are a dog of the terrier breed by F. Hoskins, and ostriches by Donald Francis and Frank Thornton.

Neville Roberts submitted a reproduction of a green tiger beetle. One of the first laws of insect land is "to eat without being eaten," and judging from its fierce expression the beetle appears to be capable of living to a good old age.

J. Mears and Miss Margaret Noyes sent models of a pheasant, and a squirrel and a horse respectively.

Making Club Reports Interesting

The beginning of the present month marks the end of the two winter sessions of 1931-32, and is a convenient time to glance backward. Perhaps the most satisfactory feature of the past winter has been the increased interest of the reports I have received from clubs. I have pointed out on many occasions that good notices of the work of a club cannot be included in the "*M.M.*" unless I have more than brief statements of the nature of each meeting to guide me. Most secretaries do their best to ensure that I shall know exactly what is happening in their clubs, particularly when novel and interesting programmes are arranged, but in certain quarters there is yet room for improvement. The responsibility for the disappointing character of reports does not always rest with the secretary, of course, and members who do not think that their clubs receive adequate mention in the "*M.M.*" should ask themselves if they are doing all they can to make the work interesting and helpful.

One striking feature of the winter's work is the number of clubs that sprang into existence completely equipped and prepared for immediate affiliation. Many of these have been formed in schools, and it is satisfactory to know that masters realise the value of a good Meccano club in increasing the interest of school life and in providing an outlet for the enthusiasm for hobbies that is characteristic of practically every boy. Clubs of this type usually start under encouraging circumstances, for they have few difficulties in regard to a club room, and one of the masters usually takes up the pleasant task of leadership and successfully guides the efforts of the members. In the long run such a club stands or falls by the enthusiasm and energy of the rank and file, however, and members must learn to rely upon their own efforts for providing ideas for interesting and varied programmes.

Perseverance Pays

There also has been an increase in the number of clubs founded by a few enthusiasts who have not yet been able to secure affiliation. In many cases difficulty is experienced in finding a Leader, while in other instances a club room cannot be obtained. I have only one word of advice for the officials of such clubs, and that is to persevere, leaving no stone unturned to remove the obstacle that prevents complete success. Many clubs that encountered similar difficulties in their early days, and for a long time appeared to make little headway, are now vigorous organisations, thanks to the energy and perseverance of the first members. What they have done can be done again. I hope that every club not yet affiliated will soon be in a position to make application, and in the meantime I shall look forward to receiving regular reports from them, and when possible shall include these in the Guild pages. The appearance of good reports is a very useful aid to publicity.

South African Club's Great Loss

All members of the Guild and of Meccano clubs throughout the world will join with me in expressing sympathy with the relatives of Mr. H. G. Price, secretary of the Malvern Methodist (Johannesburg) M.C., who was fatally stabbed in the neck by a native last Christmas Day. Mr. Price was only 25 years of age, and had been a member of the Malvern Methodist M.C. since joining it as a schoolboy in 1923. Throughout his connection with the club he showed remarkable energy, loyalty and sincerity, and his loss will be keenly felt by his brother officials and by every member of the Meccano clubs in Johannesburg.

Mr. H. G. Price, late General Secretary of the Malvern Methodist (Johannesburg) M.C., who was fatally stabbed by a native on Christmas Day last. Our photograph shows Mr. Price in the laboratories of the Chamber of Mines, Johannesburg, where he was employed as an analytical chemist.

Mr. Price was a keen all-round sportsman and at the 1927 sports meeting of the Malvern Methodist M.C. he created a record by winning every event with the exception of the long jump, while in the same year he was second in the five mile cross-country race. He also gained many cycling successes, and as a member of the South African Referees' Association he took an active interest in boys' football clubs. He began his career as a club official in 1926, when he became a member of the Junior Committee and a sectional leader, and was elected general secretary in 1930. He always took his responsibilities very seriously and his reports were models of completeness and accuracy.

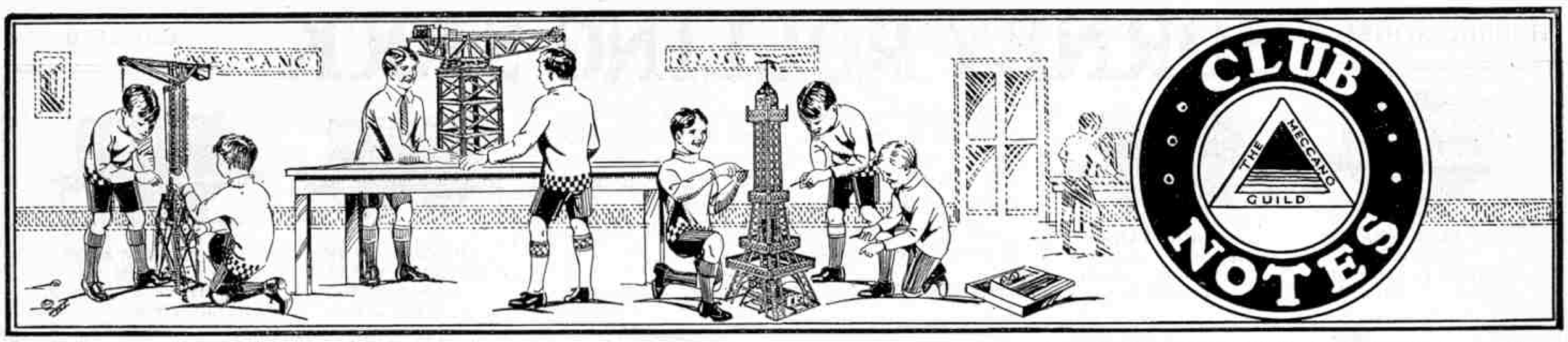
An Attractive Exhibition

The Annual Exhibition of the Holy Trinity (Barnsbury) M.C. will be held on Friday and Saturday, 29th and 30th April, in the Holy Trinity Parish Hall, Richmond Road, N.1. The charge for admission will be 6d., those under 14 years of age being admitted half-price, and the Exhibition will be opened at 5.30 p.m. on the opening day and at 2 p.m. on the Saturday. I understand that a special display of attractive models will be made and all Meccano enthusiasts are cordially invited. A special welcome will be given to officials and members of other Meccano Clubs.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested in becoming members should communicate with the promoters, whose names and addresses are given below :—

BOCKING—B. A. Holdaway, Park Terrace, Church Street.
BUENOS AIRES—V. L. M. Noguera, 1045, Montevideo Street.
INGATESTONE—Edward Hawkins, Gate House, Ingatestone, Essex.
KEMPLEY—Tom Hutchins, Green Villa, Kempley, Dymock, Glos.
NEWFOUNDLAND—Mr. W. E. Murdock, P.O. Box E 5300, Newfoundland.
SHEFFIELD—T. Parker, " Ashlea," 63, Ashland Road, Nether Edge.
SKETTY—Mr. D. T. Williams, Carnglas Road, Sketty.
WESTON-SUPER-MARE—R. G. Phillips, St. Peter's School.



St. Edmundsbury M.C.—There was an excellent display of models at the recent Exhibition, this including the Motor Chassis loaned from Headquarters. A conjuring entertainment and a cinematograph display were other attractions, and a musical interlude by the Toc H. orchestra was greatly appreciated. No charge for admission was made, but a collection realised nearly £1. A Whist Drive added to the club's resources, and a gramophone has now been purchased. Other interesting items have been a Model-building Contest in which competitors were allowed only 60 Meccano parts, and a paper on the construction of the Meccano Motor Chassis. Club roll: 22. *Secretary:* H. J. Minns, 35, Out Risbygate, Bury St. Edmunds.

Hendon M.C.—Handicraft Evening has been an interesting feature of recent meetings, members constructing stations and engine sheds for use on the club's Hornby Train Layout, which is now being extended. A Simplicity Contest has been held, the prize being awarded for a realistic model of a Traction Engine. Members also have built large models at home and brought them to the club room for entry in a special competition. Club roll: 12. *Secretary:* E. V. Woodward, "Adelaide," 36, Heming Road, Edgware, Middlesex.

St. Feock M.C.—Next to Model-building, Leatherwork continues to be the chief occupation of members, who made many useful articles for sale at the Exhibition. Excellent models were built for this event, a monthly competition having been held for models intended for the display. Fretwork also is carried on, and one member has built an interesting fretwork model railway. The secretary gave a special lecture on the Cierva "Autogiro." Club roll: 10. *Secretary:* J. Rogers, West Trevilla, St. Feock.

Brades M.C.—Prize-winning models in a recent Model-building Competition included a Pit-Head Gear, Fitting Shop and Tramcar, all being original in design and well constructed. Competition is very keen and other open contests are to follow. Meetings are well attended and model-building enthusiasm is intense. Club roll: 45. *Secretary:* G. Evans, 148, West Bromwich Street, Oldbury, Nr. Birmingham.

Gourock High School M.C.—An interesting programme was drawn up after affiliation was secured. This includes Model-building, papers by members, and talks by Mr. A. Nisbet, Leader of the club. The talks by the Leader have included an interesting explanation of the simpler mechanical movements, the descriptions being illustrated by means of Meccano models. Special attention is being paid to the development of a high standard of skill in Model-building and excellent results have followed. Club roll: 9. *Secretary:* W. Brown, 2, Grenville Road, Gourock, Renfrewshire.

Sligo M.C.—The most exciting of recent events was the appearance on the screen of a local Picture House of a film of the Meccano models and Hornby Train layouts displayed at the club's Exhibition. This has done much to arouse interest in the club. The Exhibition was carried on in association with the Sligo Branch of the H.R.C., and the club's share of the proceeds of this and of previous displays has been devoted to the decoration of the club room and the purchase of a typewriter. Club roll: 17. *Secretary:* K. McMenamin, 78, John Street, Sligo, Ireland.

King Edward's Grammar School (Aston) M.C.—Models have been exhibited at every meeting, outstanding examples including an "Invicta" Racing Car, a Motor Cycle and several interesting Aeroplanes. Mr. W. B. Chivers, B.Sc., Leader of the club, has given an interesting series of lectures on "*Copper*," "*Concrete*," and other subjects. A particularly interesting lecture by Mr. Chivers was on "*The Hammer*," the lecturer pointing out that the handle plays the same part as that of a cricket bat. Club roll: 80. *Secretary:* A. D. Horton, 77, Hampton Road, Birchfield, Birmingham.

Park Modern M.C.—Recent meetings have been specially interesting. One evening was spent in constructing a double track on tables, with Meccano Bridges spanning the gaps between them. Members brought their locomotives and rolling stock to run on the track, and spent a really happy time in operations. A second meeting was devoted to a Lecture on "*Electrical Transmission of Messages*," by Mr. J. Bright, Leader of the club. This was illustrated by experiments and pictures projected by means of the Episcope. Fortnightly events of this kind are now arranged. A series of competitions for models illustrating modern transport also has been held. Club roll: 26. *Secretary:* F. Tingey, "Hillcrest," 11, Shirley Gardens, New Barking.

Forfar M.C.—The club celebrated affiliation with a successful Exhibition. The event created great interest and the proceeds amounted to £1/5/6, although the admission fee was only 2d. Favourable notices also appeared in the local press. An interesting Debate on "*Will Airships Supersede Aeroplanes*" was stormily contested, the verdict being in favour of aeroplanes. A Football team is being organised and a Monthly Bulletin also is to be issued. *Secretary:* J. Barrett, 8, Little Causeway, Forfar.

King's School (Peterborough) M.C.—Model-building events have included a "Contractors' Night," when Bridges were built by gangs of members; "Ingenuity Night," a prize of Meccano parts being awarded for the most original idea; and "Miscellaneous Night," when models of any kind were shown. Interesting Debates have been held and visits have been paid to the local Power Station and a Beet Sugar Factory. The club also has held its first Open Night, when about 50 visitors showed great interest in the models on view. A further variety programme of Model-building Competitions, Visits and other interesting events has been arranged. Club roll: 28. *Secretary:* R. A. Hughes, 186, Lincoln Road, Peterborough.

Chiswick Crusaders' M.C.—The recent Exhibition was a wonderful success. Proceedings were opened by the Mayor of Hammersmith, and a large number of visitors then inspected the splendid models on view and visited the numerous side-shows, which included an Amusement Park, a Mock Fine Art Gallery and a Telephone Exchange alleged to enable visitors to telephone to any part of the world! Admission was by means of a souvenir programme, price 3d., that contained interesting details of the excellent models on view. A special feature was that members of the Maidstone M.C. exhibited a number of models and visited the display. Club roll: 12. *Secretary:* R. F. See, 13, Larden Road, Acton Vale, W.3.

A group of members of the Hornsea M.C., with Mr. R. W. Shooter, the enthusiastic Leader of the club, in the centre. The club's activities are of a varied nature, and Mr. Shooter makes splendid use of his cinematograph outfit, filming the members at play and while engaged in Model-building, and exhibiting instructive films at meetings. Members are divided into "Engineers" and "Apprentices," promotion to the higher grade being secured on the attainment of a good standard in Model-building skill.

1st Eston Scouts' M.C.—There has been an outburst of enthusiasm for making large models. The "Cranks" built a Hammerhead Crane in their spare time, and used this for testing the capabilities of a built-up Meccano electro-magnet. The best model built by the "Pinions" was a single-cylinder Steam Engine. The Hornby Layout has been extended, and members have been keen to build models with the No. 2 Aeroplane Constructor Outfit bought by the club. Club roll: 23. *Secretary:* C. Moore, 15, William Street, Eston.

Bridport Grammar School M.C.—Model-building, Fretwork and Woodwork are industriously carried on by members. At on Open Meeting a Lantern Lecture was given on "*Transport in Industry*," slides for this being kindly lent by Cadbury Bros. Ltd., Bournville. A small charge was made for admission and the result was a welcome increase in club funds. The formation of a Library has been commenced. Proceedings generally are businesslike, and good use is made of a printing outfit owned by one of the members, excellent notices and reports being printed. Club roll: 18. *Secretary:* R. Hyde, 6, Melville Square, East Street, Bridport.

Mall School M.C.—Great enthusiasm prevails among members. At present the accommodation available is insufficient for all those who wish to join, and a waiting list has been compiled! At the club Concert a thrilling detective drama written by one of the members was performed and was very well received. The models shown at a recent Exhibition included a Dragline, the Meccano Motor Chassis, and a Funicular Railway. A Hornby Railway working to a timetable also was included, and visitors were greatly interested in sections for the display of curios, stamps and War relics. The stalls were decorated with friezes worked in the respective colours of the school and the club. Club roll: 46. *Secretary:* K. Harrison, 51, Newry Road, St. Margarets, Twickenham, Middlesex.

AUSTRALIA

Sandgate (Queensland) M.C.—Bridges and Cranes have been the chief subjects of recent talks and Model-building Contests. The principle of the Transporter Bridge was dealt with at one meeting, and at another the chief prize in a competition for bridges was awarded for a reproduction of the arch bridge across the Tyne. Other meetings have been devoted to the construction of models of aeroplanes. Visits have been paid to the Printing Works of "*The Telegraph*," and to a Boy Scouts' Rally, while Hornby Railway track-laying contests and novelty competitions also have been held. Club roll: 11. *Secretary:* J. R. Sheridan, Sandgate Street, Deagon.

GERMANY

Berlin M.C.—Model-building has been actively pursued and members have constructed the Meccano Workshop. A No. 2 Aeroplane Constructor Outfit has been obtained and a Hornby Train Layout is to be introduced. Chess and Table Tennis are played regularly, but the chief recreation is Handball, and exciting games have been played against local teams. Marks are given regularly for Model-building and punctuality, and the prizes awarded include Meccano parts and subscriptions to the "*M.M.*" Club roll: 17. *Secretary:* L. Salbreiter, Nassauischestr. 25, Berlin.

NEW ZEALAND

Gore M.C.—Meetings are held weekly for Model-building, and at regular intervals for Hornby Train operation. The proceeds of a successful Exhibition were £5 3s. 6d., and this sum is to be added to the club funds. Stamp Collecting now has been introduced. New members will be made welcome, and those wishing to join should appiy to the Leader. Club roll: 31. *Secretary:* Mr. B. Steel, Broughton Street, Gore.

HORNBY SERIES

HORNBY ROLLING STOCK

GAUGE 0

Hornby Rolling Stock includes almost every type in use on the big railways, and a selection of the splendid range available is illustrated on this page. The various items are modelled on realistic lines, strongly built and beautifully enamelled.

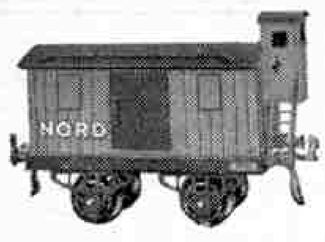
Ask your dealer to show you the full range of Hornby Rolling Stock.

OIL TANK WAGON "MOBILOIL"
Finished in battleship grey. Price **2/6**

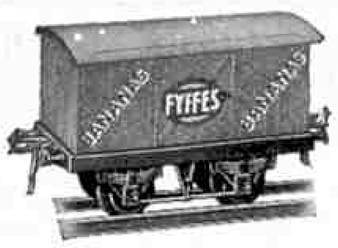
PETROL TANK WAGON "B.P."
Finished in yellow. Price **2/6**

PETROL TANK WAGON "SHELL"
Finished in red. Price **2/6**

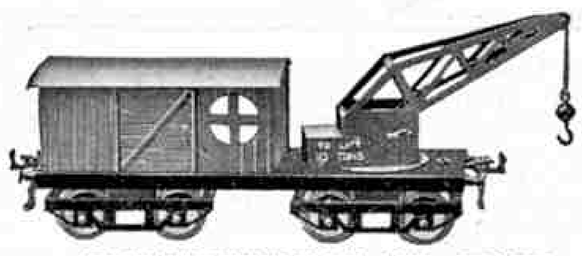
OIL TANK WAGON "CASTROL"
An attractive model. Enamelled green with lettering in red. Price **2/6**



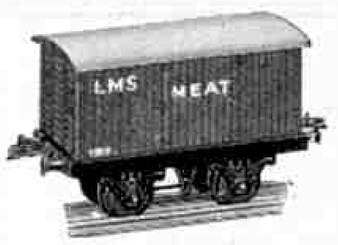
BRAKE VAN (French Type)
Lettered "Nord." Beautifully finished in colours. Opening doors. Price **4/-**



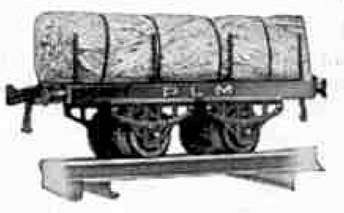
BANANA VAN
An attractive model, finished in yellow and green. Price **3/-**



***BREAKDOWN VAN AND CRANE**
Beautifully coloured in brown and blue, with opening doors. Suitable for 2-ft. radius rails only. Price **6/3**

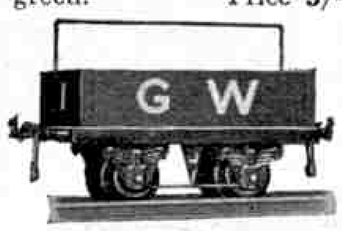


MEAT VAN
This is a very realistic model. Available lettered L.M.S. only. Price **2/6**



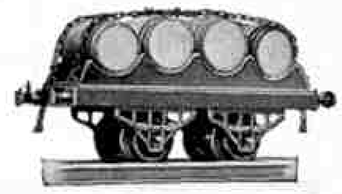
FIBRE WAGON
This is an interesting model of a type of wagon used in France and other European countries. Price **1/9**

MILK TRAFFIC VAN No. 1
Fitted with sliding doors. Complete with milk cans. Price **3/-**



***OPEN WAGON "B"**
Similar to Hornby Wagon No. 1 but fitted with centre tarpaulin supporting rail. Price **2/3**

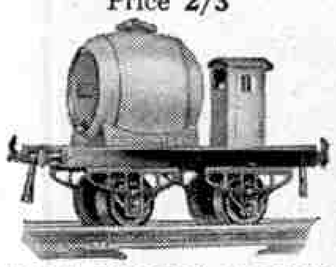
MITROPA COACH No. 3
Lettered "Mitropa," with either "Spiesewagen" or "Schlafwagen" in gold. Beautifully finished in red enamel with white roof. Price **15/6**



BARREL WAGON
This is another interesting model of a type of wagon used in France and other European countries. Price **2/9**

GAS CYLINDER WAGON
Finished in red, lettered gold. Price **2/6**

SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **2/6**



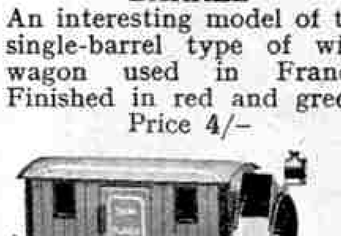
WINE WAGON, SINGLE BARREL
An interesting model of the single-barrel type of wine wagon used in France. Finished in red and green. Price **4/-**

No. 2 SALOON COACH
Realistic in design and beautifully finished. Two types are available: L.M.S. (as illustrated) enamelled maroon, and L.N.E.R. enamelled brown. Suitable for 2-ft. radius rails only. Price **11/6**

COVERED WAGON (French Type)
This wagon is fitted with frame and sheet. French type lettered "Nord." Price **3/-**

ROTARY TIPPING WAGON
Finished in orange. Price **3/-**

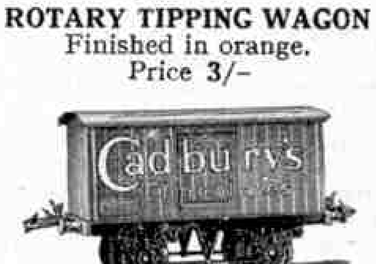
TIMBER WAGON No. 1
Beautifully enamelled in green and red. Price **1/9**



SNOW PLOUGH
With revolving plough driven from front axle. Price **5/6**

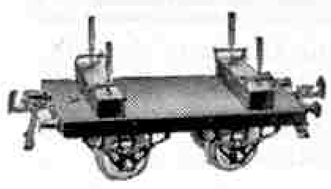
HORNBY No. 2 SPECIAL PULLMAN COACH
As supplied with No. 2 Special and No. 3 Pullman Train Sets. This splendid coach is perfect in detail and finish. Suitable for 2-ft. radius rails only. Price **15/-**

***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors. Price **3/-**

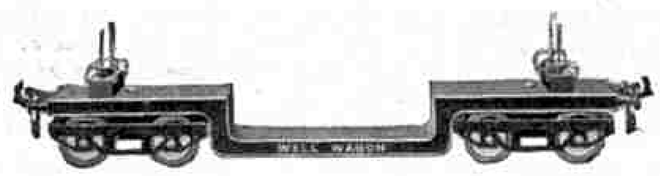


CHOCOLATE VAN "CADBURY'S"
This new van is beautifully enamelled in blue with orange roof. Price **3/-**

***GUNPOWDER VAN**
Finished in red. With opening doors. Price **3/-**

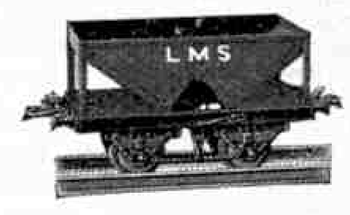


LUMBER WAGON No. 1
Fitted with bolsters and stanchions for log transport. Price **2/-**



TROLLEY WAGON
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price **4/6**

CRANE TRUCK
Finished in brown and blue. Price **3/6**

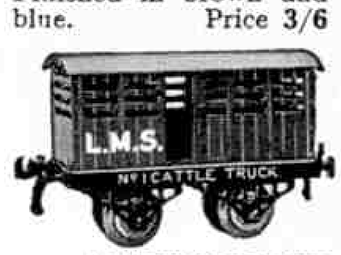


***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/6**

BITUMEN TANK WAGON "COLAS"
Finished in blue. Price **5/3**

MITROPA COACH No. 0
Finished in red with white roof. Lettered "Mitropa," with either "Speisewagen" or "Schlafwagen" in gold. Price **1/6**

TIMBER WAGON No. 2
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price **3/6**

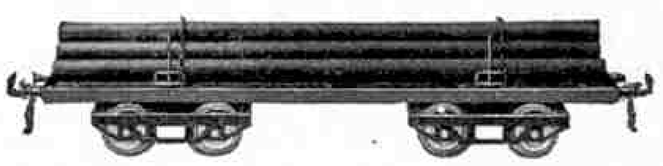


***CATTLE TRUCK No. 1**
Fitted with sliding doors. Very realistic design. Price **3/-**

MILK TANK WAGON "UNITED DAIRIES"
A very realistic model, finished in blue and white. Price **6/-**

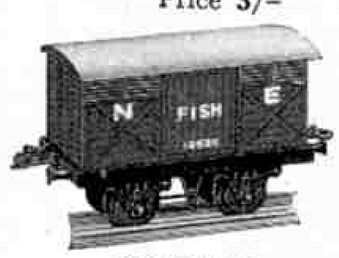
MILK TRAFFIC VAN No. 0
An attractive model. Available lettered G.W. only. Price **2/6**

COAL WAGON
This is similar to Hornby Wagon No. 1. It is fitted with embossed representation of coal. Price **2/3**



LUMBER WAGON No. 2
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only. Price **4/-**

*In L.M.S., L.N.E.R., G.W. or S.R. lettering.



FISH VAN
This is a distinctive model. Available lettered N.E. only. Price **2/6**

SECCOTINE VAN
Beautifully finished in blue. With opening doors. Price **3/-**

Manufactured by MECCANO LIMITED, BINNS ROAD, OLD SWAN, LIVERPOOL

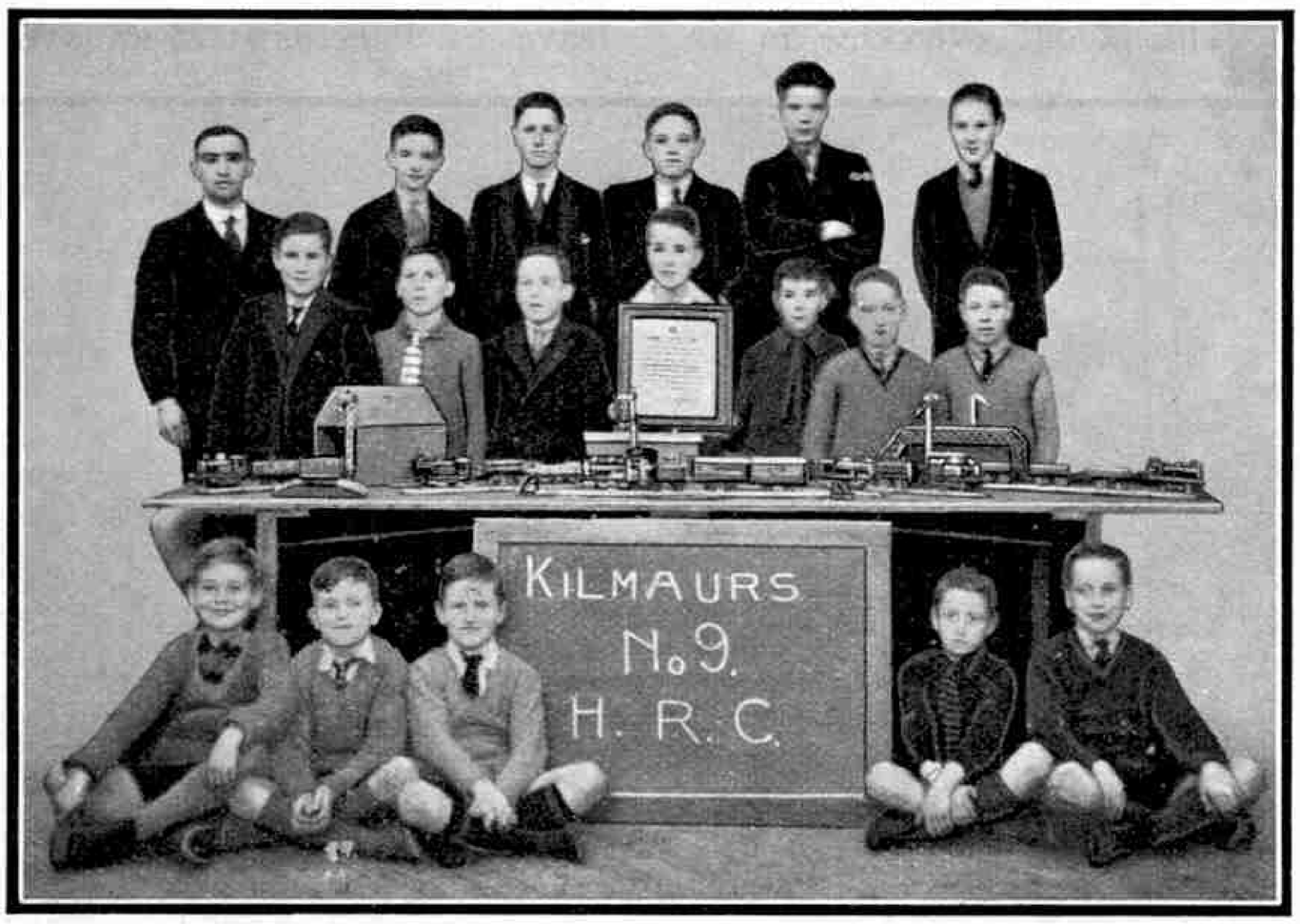
Branch Notes

HOLYROOD SCHOOL (BOGNOR REGIS).—A vigorous recruiting campaign led to a large increase in membership and interest is extremely keen. A splendid scheme adopted by this Branch is the provision of a workshop, open to all members, in which facilities for repairing miniature railway material and Meccano accessories are available. Locomotives owned by members were entered in a miniature reproduction of the Rainhill trials of 1831, in which the "*Rocket*" proved superior to other pioneer engines. The purpose of the Branch trial was to discover the most suitable locomotives for express work on the track. Secretary: C. J. Harris, Holyrood School, Bognor Regis.

SLOUGH (SOUTH BUCKS.).—Additions to the Branch track are being made as funds become available, and a new set of regulations for timetable working has been drawn up. Experience gained in track work has enabled more satisfactory rules to be decided upon, and operations on the track have been very successful. At one meeting a station layout complicated by the presence of an awkward bottle-neck was worked, members being greatly interested in devising means for overcoming the difficulties presented. The success of the scheme suggests that enjoyable evenings could be spent with layouts involving similar difficulties encountered in real railway work. Secretary: J. Hare, 146, Windsor Road, Slough, S. Bucks.

CATERHAM SCHOOL.—The Branch room is open almost every day to enable members to run trains. A special feature of the work is a series of lectures on railway subjects. This has included one by a member on "*The History of Railways*," and a Lantern Lecture on "*The Underground Railways of London*" by Mr. K. C. Sparrow, Chairman of the Branch. Membership has increased, and as new-comers are very enthusiastic, the future of the Branch is very promising. Secretary: M. Kirkpatrick, Long Street, Sherborne, Dorset.

ST. ANDREW'S CHURCH (COBHAM).—This Branch is making splendid progress and now has acquired a large quantity of railway material. A complete signalling system is in operation, and members are giving special attention to this part of the work, with the result that timetable running is very successful. Occasionally there are mishaps, but these are promptly dealt with by the Breakdown Train, and a special report is presented to the authorities. If necessary, methods are then altered in order to avoid further accidents. A local model-railway enthusiast kindly invited senior members to inspect his electric layout. This was a great treat, for the visitors were allowed to run the locomotives and to operate points and signals from the cabins. Secretary: A. E. J. West, "Fernlea," 13, Freelands Road, Cobham, Surrey.



Members of the Kilmaurs Branch, No. 9. Chairman: Mr. J. Clark; Secretary: Hugh T. Stewart. The Branch has an excellent stock of Hornby material, and interesting operations are carried out on an extensive track laid down on tables. Visitors are frequently invited to the Branch meetings in order to see for themselves how realistic miniature railway work can be made.

LOUGHBOROUGH GRAMMAR SCHOOL.—Additional locomotives, including a Midland "Compound," have been acquired, and more rolling stock is to be obtained. Electric lighting has been installed in the stations and engine sheds, and also along certain portions of the track. One terminal and two through stations are now included in the layout, and work has been commenced on the construction of a large marshalling yard. Secretary: F. Smith, Grammar School, Loughborough.

ST. CHRISTOPHER (JUNIOR SCHOOL).—Train operations have engaged the attention of members at recent meetings, and timetable working has been carried out on a very interesting layout on which seven locomotives and a Metropolitan Train Set were in use. Each operator carried out definite duties and very satisfactory running was achieved. The main track is to be laid on a raised foundation, and it is hoped to provide a separate siding for the accommodation of the railway stock of each member. Secretary: G. Morriss, Maryland, Sollershott W., Letchworth, Herts.

FIRST BOURNVILLE.—A new terminal station on a branch line has been completed and the greater part of the rolling stock has now been fitted with automatic couplings. A shunting contest has been held, and a series of trials of members' locomotives created great interest. A discussion was held on the keenly-debated topic, "*Steam Locomotives v. Electric Locomotives.*" Plans for the future include the installation of the colour light system of signalling, all signals and points to be controlled from cabins. Secretary: L. D. Hall, 11, Franklin Road, Bournville.

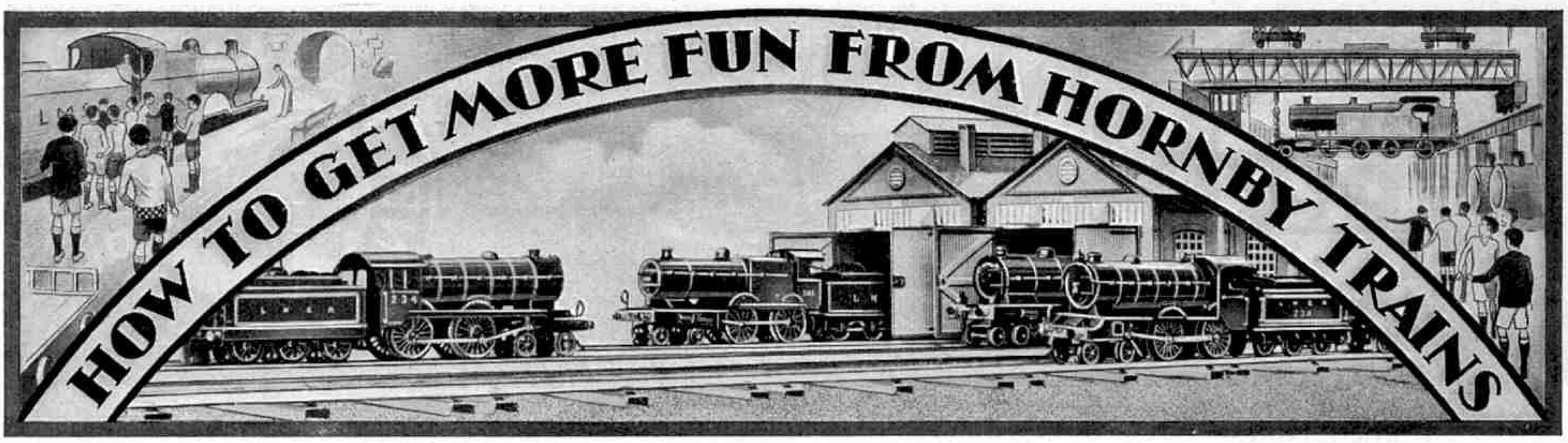
Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

DOVER.—W. Ward, 129, Clarendon Street.
LANCASTER.—J. Tredinnick, Storey House, Royal Grammar School.
MANCHESTER.—E. Kenneth Hattersley, 33, Queen's Road, West Didsbury.
TEDDINGTON.—G. W. T. Roberts, 67, Cambridge Crescent.

Branches Recently Incorporated

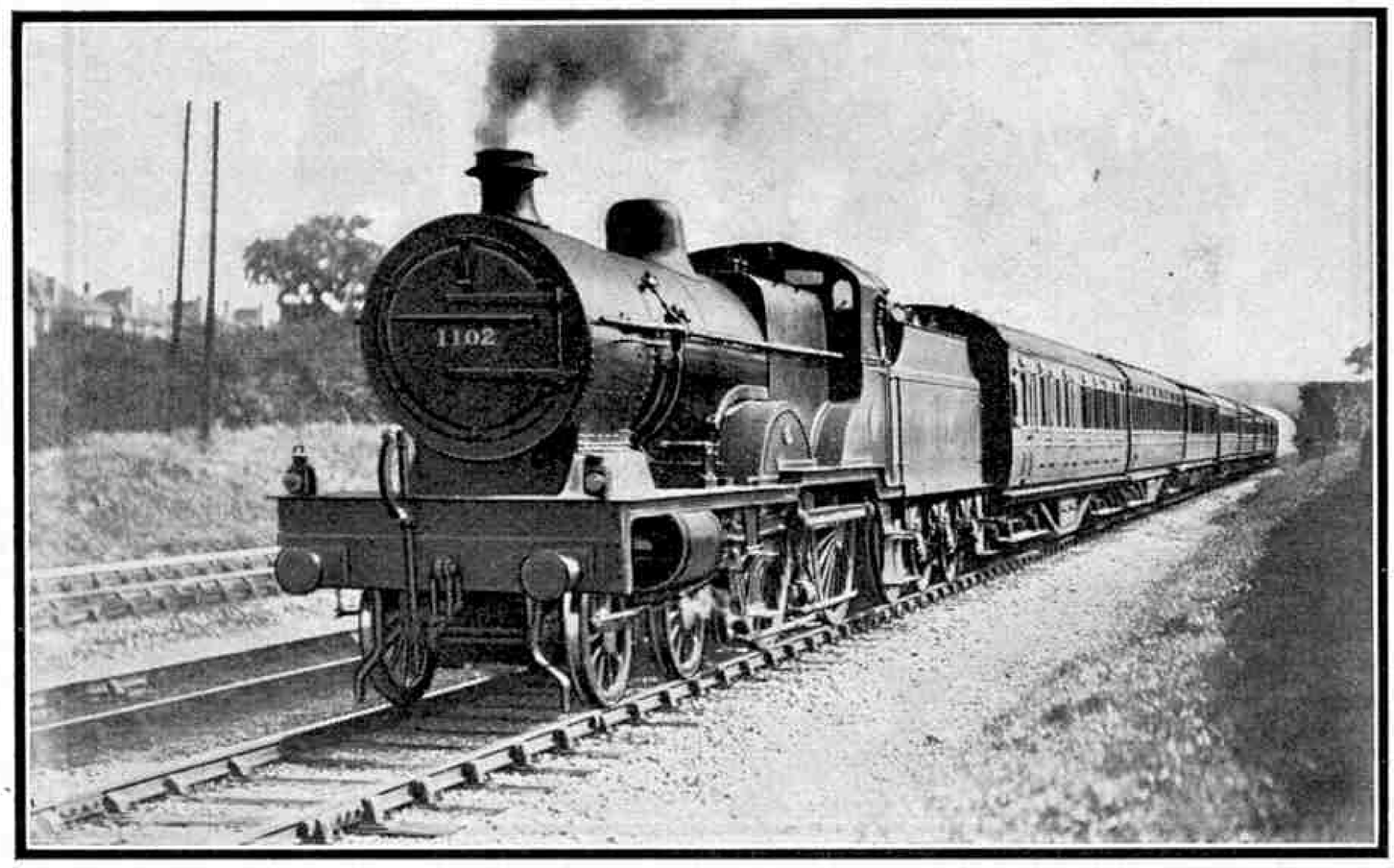
210. CATERHAM SCHOOL—M. D. Kirkpatrick, Long Street, Sherborne.
211. HOLYROOD SCHOOL—C. J. Harris, 29, Holyrood School, Bognor Regis.
212. WEST HARTLEPOOL AND DISTRICT—Robert B. Carney, 48, Carlton Street, West Hartlepool.
213. TILEHURST—C. W. Whiteley, Hill Top, Westwood Road, Tilehurst, Reading.
214. WELWYN GARDEN CITY—E. N. Lowe, 31, Attimore Road, Welwyn Garden City.



XLII.—A MINIATURE "MIDLAND" SYSTEM

MANY readers will remember that in these pages in May, 1930, we described a layout and the method of operating it as adopted by an H.R.C. member, W. Binns, of Blackpool. Suitably enough the section of main line represented was the L.M.S.R. route between Manchester and Blackpool, and the chief trains run were the well-known Blackpool "Club" trains that were instituted in the days of the Lancashire and Yorkshire Railway. The layout overcame in a reasonable and interesting manner the difficulties that are inevitably met with when it is attempted to compress a miniature reproduction of a large area of railway into the narrow limits of the average room.

Details of other layouts of a similar kind have been received from time to time, and perhaps the most interesting of these is that of R. C. Evans, of Shrewsbury, a diagram of which is reproduced on page 303. Once again an L.M.S.R. system is represented but this time it is the Midland section. For various reasons the characteristics and practice of that line are very suitable for following up on a small scale, and a strong argument in its favour as a prototype is the splendid "Midland Compound" locomotive of the Hornby Series. We propose therefore to describe the layout illustrated, and to make various suggestions regarding features of working that we think will interest our readers.



A Manchester express of the L.M.S.R. Midland section near Mill Hill. The engine is one of the Standard Compounds, No. 1102. (Photograph, Railway Photographs, Liverpool.)

As the diagram shows, the outer main track of the layout is approximately square. A branch line leads off the lower side into "St. Pancras," the London terminus of the Midland. Derby, the headquarters of the real system, is centrally situated as in actual practice, and is placed on a loop joining the upper and lower sides of the layout. This loop is joined to the upper side by a triangular junction, and the interesting point about this formation is that in working a service this corresponds to Ambergate, where in actual practice the station itself is triangular in shape with platforms on all three sides. The northern objective of this miniature system is "Manchester," and this is conveniently situated for operating within the bounds of the main line proper. A notable series of expresses may therefore be run on the line, representing the well-known Midland Manchester expresses. These have long been famous as the "Twenty-Fives," for each leaves St. Pancras at 25 minutes past a particular hour, and they have already been dealt with in the "*M.M.*" The layout is capable of improvement in certain details, but the main scheme is satisfactory, and no doubt will be useful to many readers, for the L.M.S.R. is a popular group. There is, of course, no reason why the same principles should not be applied to layouts representing the systems of other companies, with equally good results.

"St. Pancras" station on the miniature system is a simple two-road affair with an island platform. This is quite sufficient for the amount of traffic dealt with, and a useful provision is the run-round facilities, even though this feature is not in accordance with the actual station. Such deviations have frequently to be tolerated in miniature working, owing to space restrictions and the necessity for making the most of available track material. The platform is not long, but this is no objection, as St. Pancras is not a remarkably big place. The practice of limiting the loads to be hauled by each class of engine, and their necessary rigid enforcement owing to gradients, keeps down the length of the trains, and this in itself is a feature that commends the Midland for reproduction in miniature. A train of perhaps three or four bogie vehicles will be quite sufficient to represent a Midland express, though these actually are made up of more vehicles.

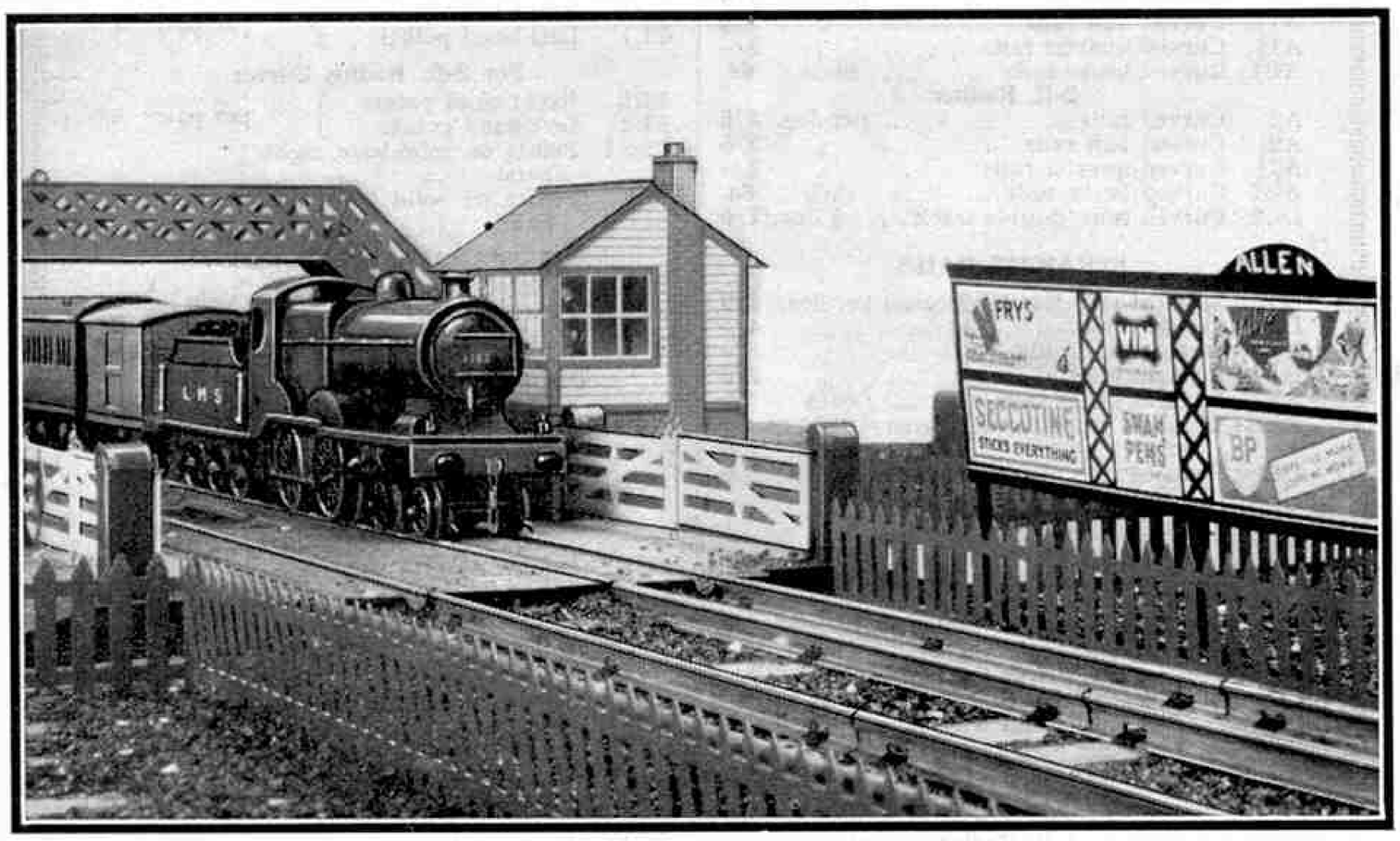
An interesting practice observed at St. Pancras, and which has been characteristic for a number of years,

is that of banking outgoing expresses from the station to give them a good start. This is often quite vigorously carried out, and will form a fascinating method of operating to copy, if done with due care. Also, as the "Twenty-Fives," as we may call them, stop at Leicester and Derby, the trains are quite suitable for hauling by miniature clockwork locomotives, and the sense of distance covered will be strengthened, if the engine is rewound at each stop.

Leaving the terminus, the trains proceed round the continuous main line as many times as required. No stations are arranged on this stretch of line, and although this adds to the illusion of a miniature express covering long distances, a stopping place of some kind would be preferred by some operators. This could represent Leicester, where the first stop is made; but if no name is displayed on the station it could be used also for other places as might be required when stopping services were being run. This is a point to be settled by the choice of the individual enthusiast.

The train arrives in due course at "Derby," where, as is very suitable, the locomotive sheds are placed. This is the locomotive headquarters of the Midland and in the miniature system we are now describing, a centrally-situated shed is an advantage, as the engines are all kept together and may proceed to any part of the line as required. Here, as in actual practice, the engine may be taken off the train from "St. Pancras" and another put on to complete the journey, though systems that are not so fortunate in the matter of locomotive power will have to forego this luxury. An alternative adopted by some miniature railway owners is to move the engine to a little distance and then return it to the train as a fresh engine.

The train takes the West or left-hand leg of the triangle, representing Ambergate, just as the real "Twenty-Fives" do; and finally is run into "Manchester Central" by means of the other leg, actually, of the same junction! It may be wondered what happens when the train arrives and is required to work the return service. The triangle provides the solution, for the whole train may be pushed out backward round the East or West curves, run along the straight length of main line between them, and then reversed into the station.



A miniature express train on a Hornby L.M.S. railway. The resemblance of the No. 2 Special Locomotive to its prototype on the opposite page is very striking.

Where two express engines are available the other engine may of course back on to the train and haul it away when ready, the arriving engine being released on its departure.

In working these trains there is some scope for the operation of through coaches, for in actual practice vehicles for Liverpool are run on certain trains. These are detached at Cheadle Heath some miles outside Manchester, and continue their journey over the Cheshire Lines system to Warrington and Liverpool. The suggestion therefore, when running the train between "Derby" and "Manchester" is to arrange for a stop at "Cheadle Heath," which may be represented by making use of "Derby" station. The train will enter the station in the opposite direction to that formerly taken, and a coach may be detached from the rear. The main train may then run on and into "Manchester," but what happens to the Liverpool portion? Another locomotive backs out from the shed and takes charge, running it into the terminus whence we started, in order to represent Liverpool. If engines have been changed at the stop for "Derby," the engine that comes off the train may run forward in order to negotiate the West curve, be reversed, and then return over the East curve, waiting on it until the train leaves with the other engine. It can then run into the locomotive yard and, having been reversed as a result of its movements over the junction, will be ready to take up the running of the portion detached when in due course the train arrives at "Cheadle Heath." Details of this kind can be left to individual operators, however, who will plan their working arrangements according to the particular stations involved on their line.

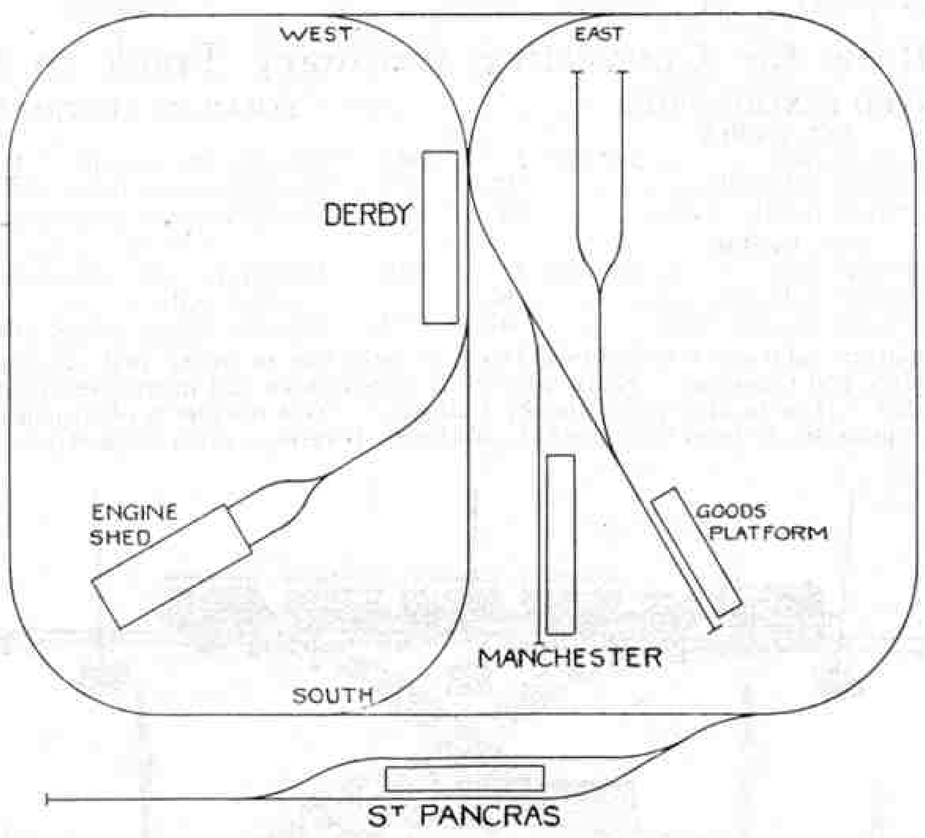
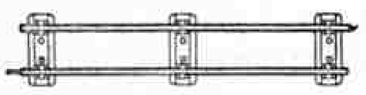


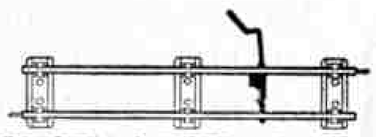
Diagram showing the "Midland" layout of R. C. Evans of Shrewsbury. Interesting train operations are possible upon it, as described in this article.

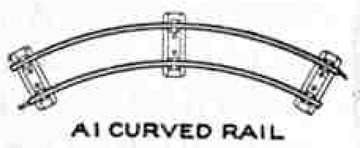
As regards locomotive power, a Hornby No. 2 Special L.M.S.R. will be the obvious choice, for "Compounds" are the mainstay of the Manchester services on the Midland, and follow up the good work carried out in the past, and still done by the original 45 Midland engines. No. 2 Saloon Coaches in L.M.S.R. colours may represent the stock commonly used now on L.M.S.R. express trains, and the engine should find no great difficulty in hauling three or four of these on a good track with everything in first-class running order. The length of the station

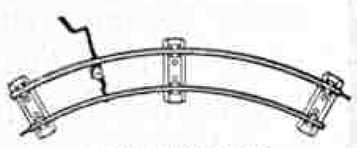
(Continued on page 314)

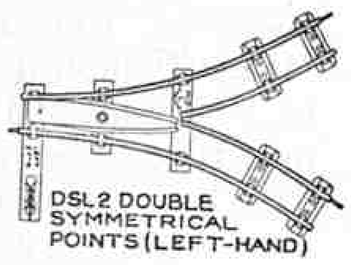
Hornby Rails, Points and Crossings

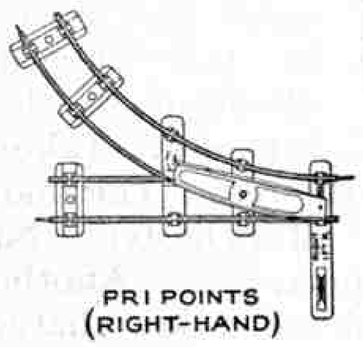

B1 STRAIGHT RAIL

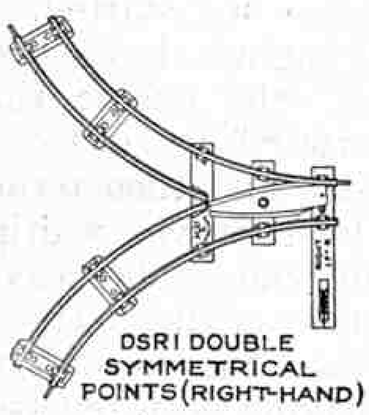

BB1 STRAIGHT BRAKE RAIL

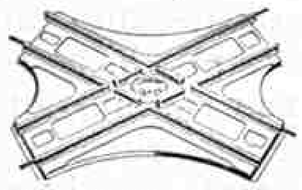

A1 CURVED RAIL


AB1 CURVED BRAKE RAIL


DSL2 DOUBLE SYMMETRICAL POINTS (LEFT-HAND)


PR1 POINTS (RIGHT-HAND)


DSR1 DOUBLE SYMMETRICAL POINTS (RIGHT-HAND)


CA2 ACUTE-ANGLE CROSSING

Rails for Clockwork and Steam Trains, Gauge 0, 1¼″

CURVED RAILS

9-in. Radius (for M0 Trains)

M9	Curved rails	per doz. 3/–
MB9	Curved brake rails	each 3½d.

1-ft. Radius

A1	Curved rails	per doz. 4/6
A1½	Curved half rails	„ 3/6
A1¼	Curved quarter rails ...	„ 3/–
AB1	Curved brake rails	each 6d.

2-ft. Radius

A2	Curved rails	per doz. 4/6
A2½	Curved half rails	„ 3/6
A2¼	Curved quarter rails ...	„ 3/–
AB2	Curved brake rails	each 6d.
DC2	Curved rails, double track ...	½ doz. 7/6

STRAIGHT RAILS

BM	Straight rails (for M0 Trains)	per doz. 2/9
B1	Straight rails	„ 4/–
B½	Straight half rails	„ 3/–
B¼	Straight quarter rails ...	„ 2/6
BB1	Straight brake rails... ...	each 5d.
BBR1	Straight brake and reverse rails	„ 1/6
DS1	Straight rails, double track	½ doz. 6/6

CROSSINGS

CA1	Acute-angle crossings (for 1-ft. radius tracks)	each 2/–
CA2	Acute-angle crossings (for 2-ft. radius tracks)	„ 1/9
CR1	Right-angle crossings (for 1-ft. radius tracks)	„ 2/–
CR2	Right-angle crossings (for 2-ft. radius tracks)	„ 1/9

POINTS

9-in. Radius (for M0 Trains)

MR9	Right-hand points	per pair 3/–
ML9	Left-hand points	

For 1-ft. Radius Curves

PR1	Right-hand points	per pair 4/–
PL1	Left-hand points	

For 2-ft. Radius Curves

PR2	Right-hand points	per pair 4/–
PL2	Left-hand points	
PSR2	Points on solid base, right-hand	per pair 8/6
PSL2	Points on solid base, left-hand	

PARALLEL POINTS

PPR2	Parallel points, right-hand	per pair 5/–
PPL2	Parallel points, left-hand	
RCP	Rail Connecting Plates ...	½ doz. 2d.

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

DSR1	Double symmetrical points, right-hand	per pair 5/–
DSL1	Double symmetrical points, left-hand	

For 2-ft. Radius Curves

DSR2	Double symmetrical points, right-hand	per pair 5/–
DSL2	Double symmetrical points, left-hand	

CROSSOVER POINTS

COR2	Crossover points, right-hand	per pair 12/–
COL2	Crossover points, left-hand	

Rails for Electric Trains, Gauge 0, 1¼″

CURVED RAILS

1-ft. Radius

EA1	Curved rails	per doz. 6/6
EA1½	Curved half rails	„ 4/6
EA1¼	Curved quarter rails ...	„ 4/–

2-ft. Radius

EA2	Curved rails	per doz. 6/6
EA2½	Curved half rails	„ 4/6
EA2¼	Curved quarter rails ...	„ 4/–
EDC2	Curved rails, double track	½ doz. 9/–

STRAIGHT RAILS

EB1	Straight rails	per doz. 6/–
EB½	Straight half rails	„ 4/6
EB¼	Straight quarter rails ...	„ 4/–
EDS1	Straight rails, double track	½ doz. 8/6

POINTS

For 2-ft. Radius Curves

EPR2	Right-hand points	per pair 7/6
EPL2	Left-hand points	

CROSSINGS

ECA	Acute-angle crossings ...	each 4/–
ECR	Right-angle crossings ...	„ 4/–

DOUBLE SYMMETRICAL POINTS

For 2-ft. Radius Curves

EDSR2	Double symmetrical points, right-hand	per pair 8/6
EDSL2	Double symmetrical points, left-hand	

PARALLEL POINTS

EPPR2	Parallel points, right-hand	per pair 8/6
EPPL2	Parallel points, left-hand	

CROSSOVER POINTS

ECOR2	Crossover points, right-hand	per pair 24/–
ECOL2	Crossover points, left-hand	
TCPL	Terminal Connecting Plates (low voltage)	each 1/6

Electrical Points for 1-ft. radius curves are not supplied.

Centre Rails for Converting Ordinary Track to Electrical

CURVED CENTRE RAILS

1-ft. Radius

AC1	Curved centre rails ...	per doz. 1/–
AC1½	Curved centre half rails ...	„ 9d.
AC1¼	Curved centre quarter rails	„ 6d.

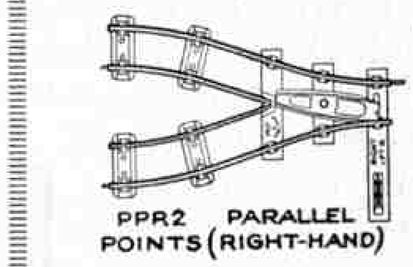
2-ft. Radius

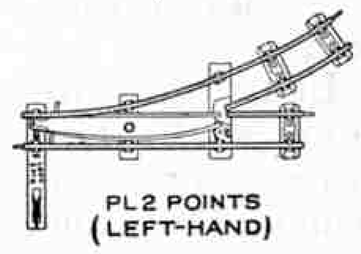
AC2	Curved centre rails ...	per doz. 1/–
AC2½	Curved centre half rails ...	„ 9d.
AC2¼	Curved centre quarter rails	„ 6d.

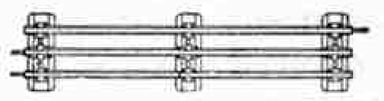
STRAIGHT CENTRE RAILS

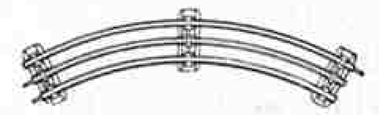
BC1	Straight centre rails ...	per doz. 1/–
BC½	Straight centre half rails ...	„ 9d.
BC¼	Straight centre quarter rails	„ 6d.
ICR	Insulators for insulating centre rails	per doz. 3d.
CCR	Clips for fixing centre rails	„ 6d.

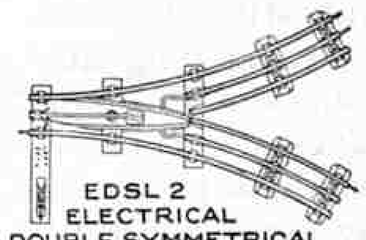
The realistic miniature railway layout shown below is only one of many that can be constructed with Hornby Rails, Points and Crossings. Many interesting illustrations and much useful information is given in a booklet entitled "How to plan your Hornby Railway." This booklet is obtainable from your dealer, price 3d., or from Meccano Ltd., Old Swan, Liverpool, price 4d. post free.

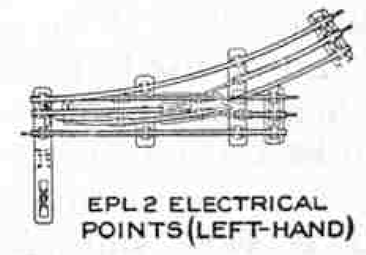

PPR2 PARALLEL POINTS (RIGHT-HAND)

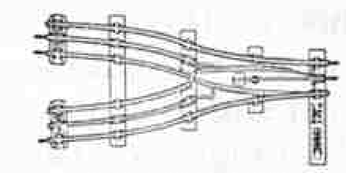

PL2 POINTS (LEFT-HAND)

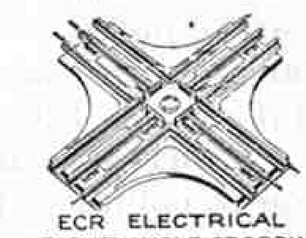

EB1 ELECTRICAL STRAIGHT RAIL

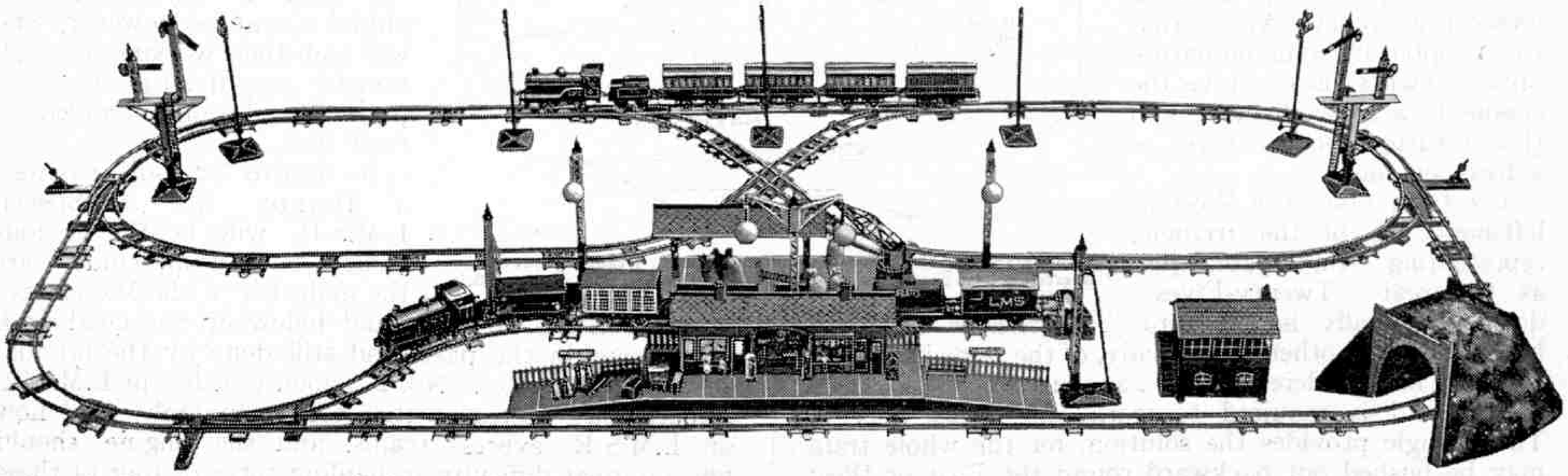

EA1 ELECTRICAL CURVED RAIL


EDSL2 ELECTRICAL DOUBLE SYMMETRICAL POINTS (LEFT-HAND)


EPL2 ELECTRICAL POINTS (LEFT-HAND)


EPPR2 ELECTRICAL PARALLEL POINTS (RIGHT-HAND)


ECR ELECTRICAL RIGHT-ANGLE CROSSING



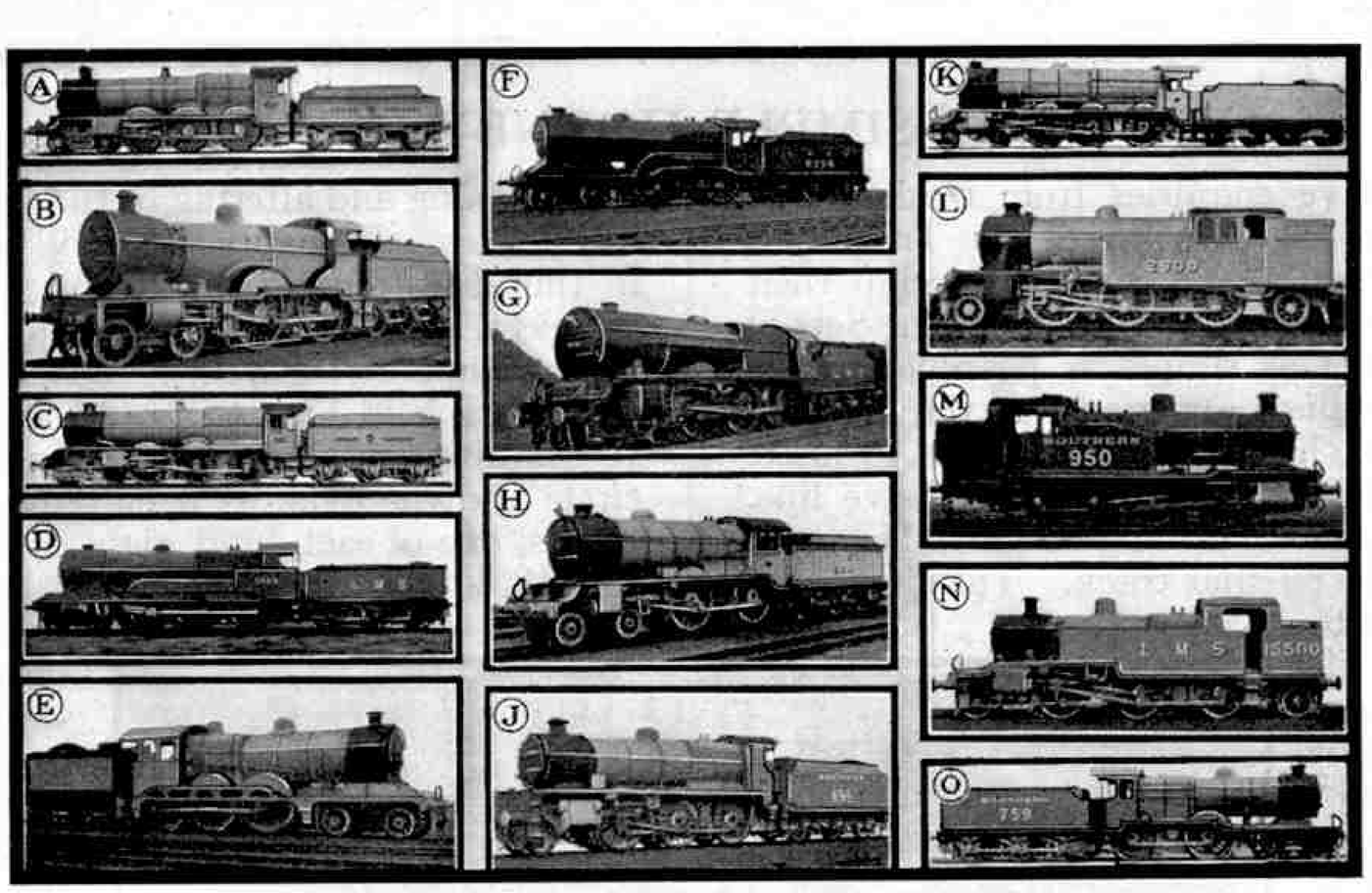
Manufactured by MECCANO LIMITED - OLD SWAN - LIVERPOOL

H.R.C. COMPETITION PAGE

Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries should have the title of the competition clearly written in the top left-hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

"MY FAVOURITE LOCOMOTIVE"

There is probably no subject that causes so much controversy among railway enthusiasts as that of the merits of different locomotives. The steam locomotive is admired by everybody, and few people, even those whose interest in railways is slight, are without a preference for some particular engine. The favourite locomotive may be selected purely on its merits as regards power and speed. On the other hand it may be the one with which we are most familiar, or one that we associate with pleasant journeys to holiday resorts. Whatever be the ground of his choice, it is certain that every H.R.C. member has a favourite locomotive, for which he is willing to take up the cudgels as soon as any mention is made of a possible rival type or class!



This month's competition is intended to ascertain which locomotive has the greatest number of admirers among H.R.C. members. The accompanying illustration shows a number of well-known British engines, and competitors are asked to place them in their order of popularity. If a competitor's favourite does not appear in the illustration, it should be written down separately at the bottom of the voting list, and marked "My Favourite Engine." In making out their lists competitors should not give the names of the engines, but only their reference letters.

To the competitor whose selection compares most nearly to that arranged by the massed vote will be awarded Hornby Train goods (or Meccano products if preferred) to the value of 21/–. Similar goods to the value of 15/–, 10/6 and 5/– respectively will be awarded to the senders of the three next best entries. In addition a number of consolation prizes will be given. In the case of a tie for any one prize neatness and novelty in presentation will be the deciding features. Envelopes should be clearly marked H.R.C. "*Popular Locomotive Contest*" in the top left-hand corner and should be posted to reach H.R.C. Headquarters at Meccano Ltd., Binns Road, Old Swan, Liverpool, on or before 30th April. The Overseas closing date is 30th July. All entries submitted must bear the competitor's H.R.C. membership number, omission of which will result in immediate disqualification.

Layout Planning Contest

Model railway operation is the chief pastime of all H.R.C. members. Many hours of fun are spent in running trains to a pre-arranged timetable, and copying actual practice as far as possible. Owing to limitations of space or equipment it is probable that most miniature systems are laid with single track, but this makes their working none the less interesting, especially where trains are run in both directions. No doubt H.R.C. members have many schemes for the planning and operation of an efficient system of this kind, and this month we invite them to send us their own ideas of "A Single Line Layout and the Best Method of Working It."

To the senders of the four best entries received in each section—Home and Overseas—Hornby Railway material (or Meccano products if preferred) to the value of 21/–, 15/–, 10/6 and 5/– will be awarded respectively. In addition a number of consolation prizes will be given.

Envelopes containing entries should be clearly marked H.R.C. "*Layout Planning Contest*" and posted to reach Headquarters at Meccano Ltd., Binns Road, Old Swan, Liverpool, on or before 30th April. The closing date for the Overseas section is 30th July.

Drawing Contest

Members of the H.R.C., and in particular H.R.C. Branch members, are keen visitors to engine sheds. These visits enable members to make a close study of the "inside workings" of different types of locomotives. To go down into the pits and study a "dead" locomotive from underneath is a thrill, but to climb on to its footplate and operate the regulator and other fittings is the greatest thrill of all. Many H.R.C. members will not have had this splendid opportunity, but all are more or less familiar with the arrangement of the various mechanisms in an engine cab. For our Contest this month we invite competitors to make a drawing of "*An Engine Cab and its Fittings.*"

Prizes consisting of Hornby Railway material (or Meccano products if preferred) to the value of 15/–, 10/6, 5/– and 2/6 respectively will be awarded to the senders of the four best entries received in each section—Home and Overseas.

Envelopes containing entries should be clearly marked H.R.C. "*Cab Drawing Contest*" and posted to reach Headquarters at Meccano Ltd., Binns Road, Old Swan, Liverpool, on or before 30th April. The closing date for the Overseas section is 30th July.

COMPETITION RESULTS

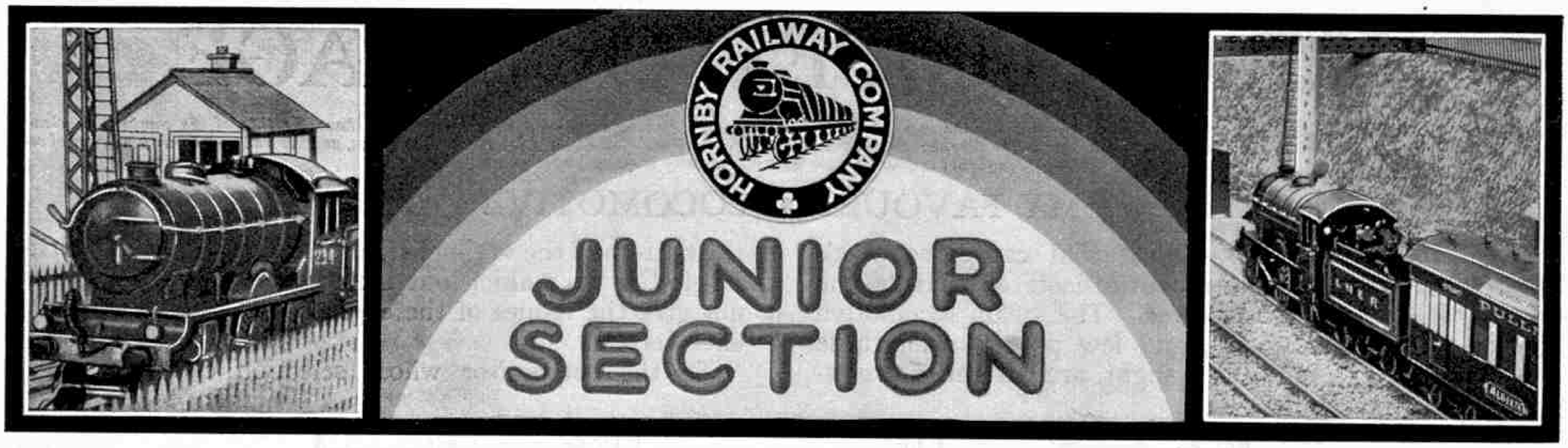
HOME

January "Railway Route Contest." First: L. Ward (4410), Mansfield, Notts. Second: R. Barbary (5580), Mevagissey, Cornwall. Third: M. Hoskins (16653), Exeter. Fourth: I. Preece (27985), East Acton, London, W.3. Consolation Prizes: P. F. Dodd (3431), Didsbury, Manchester; M. Bumstead (27764), Gosport, Hants.; P. Hooper (8182), Wallasey, Cheshire; J. A. Ecclestone (20575), Shrewsbury, Shrops.; R. G. Spence (16283), Caterham, Surrey; W. Surtees (25416), Haydon Bridge; G. F. Chambers (13787), Belfast; A. E. Gordon (231), Birkdale, Lancs.; H. J. Mansfield (18802), Lee, London, S.E.13; H. P. Haile (14499), Forest Hill, London, S.E.23; R. Bennett (9753), Ladywood, Birmingham; H. C. Thompson (25825), Liverpool.

January "Snow Plough Drawing Contest." First: P. A. Vicary (25935), Cromer, Norfolk. Second: V. C. Kaile (17559), Mayford, Nr. Woking. Third: C. A. Brunt (10229), Leeds. Fourth: G. Horne (18929), Southsea, Hants. Consolation Prizes: H. Everitt (18738), Norbury, London, S.W.16; H. Sutcliffe (4855) Horbury Bridge, Nr. Wakefield, Yorks.; E. Baines (25807), Skellow, Doncaster; K. Pearce (21549), Lymington, Hants.; R. C. Storrar (8625), Letham Ladybank, Fifeshire; F. Shaw (3342), Lancaster, Lancs.

OVERSEAS

October "Mutilated Names Contest." First: D. J. White (9333), Dunedin, New Zealand. Second: J. A. Rodriguez (3647), Montreal, P.Q., Canada. Third: R. A. Wragg (7913), Bandikui, Rajputana, India. Fourth: R. B. McMillan (9592), Melbourne, S.2, Australia. Consolation Prizes: G. Hallack (17578), Capetown, S. Africa; H. C. Key (24764), Calcutta, India; B. Chiles (9191), Port Elizabeth, S. Africa; H. D. Webber (8853), Johannesburg, S. Africa; J. G. Gnanadurai (1964), Trichinopoly, India; F. Biaggi, Milan, Italy; W. Fagg (8557), Milton, Otago, N.Z.



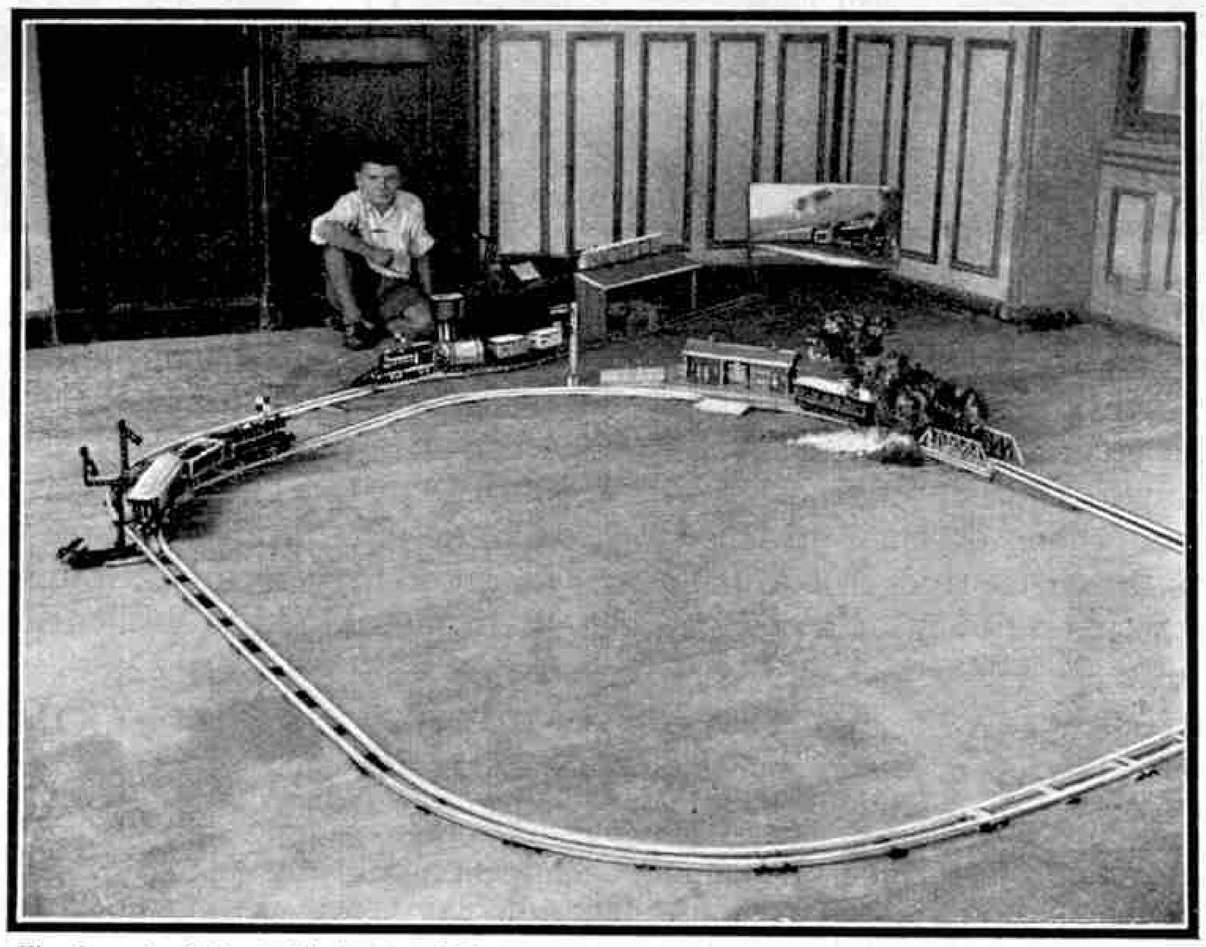
XL.—SOME SIMPLE HORNBY LAYOUTS

WE frequently receive enquiries from readers who have purchased one or other of the Train Sets of the Hornby Series, and wish to develop their layouts. For obvious reasons the contents of the Sets in respect to track are kept as simple as possible, but as soon as the owner has gained experience in the management of the locomotive, he desires to be able to make better use of its capabilities on a more extensive line. Many of our readers are no doubt familiar with the usual methods of adding to the circular track. The circle may be split up as it were into two systems, straight rails being introduced between them, or it may be split into four, and straight rails added to the ends of the layout as well. The number used depends on the space available for the accommodation of the layout, and this, too, governs the final shape of the plan.

The possession of points is a great advantage however, and their addition to the equipment usually takes place fairly soon. A choice of routes is thus afforded for the train, or the possibility of arranging loop lines and sidings for the storage of locomotives and rolling stock. Of the two, as we have seen previously in these pages when dealing with sidings, the loop line is more useful generally in miniature, for trains can be run in or out as required at either end of the loop. Troublesome backing movements are thus avoided, time is saved, and the operation of the railway carried out more smoothly as a result.

Most railways are of the portable variety, and as a rule have to be taken up after use. Although this appears to the youthful railway manager as a nuisance, it is not quite such a disadvantage in the long run as it seems. Fresh rail formations will suggest themselves, and the possibilities of Hornby track may be tried out more fully. Arrangements that do not work with a great deal of success may be discarded, and it will be remembered to avoid them when laying the line again on some other occasion. Lines that are laid on the floor naturally have to avoid various articles of furniture, and the planning and altering of the line to effect this is quite interesting. Probably there will be plenty of opportunity in this direction for most boys, owing to the domestic upheavals and re-arrangements that commonly occur at this time of the year!

The track in Fig. A should therefore be interesting. It combines in an unusual manner our old friends the circle and the oval, as it employs two ordinary turnout points, one of each kind, right-hand and left-hand. The rest of the rails are the usual straights and curves, and an interesting feature of the outer main track is that the ends are made to slope, as it were, instead of the straight lines running across at right-angles to the side tracks. This is useful where furniture has to be avoided, as suggested previously, or where it is necessary to allow for the opening of the door leading into the room. Further developments in this respect may be necessary, and will suggest themselves to model railway owners when they are faced with the usual problems of this kind.



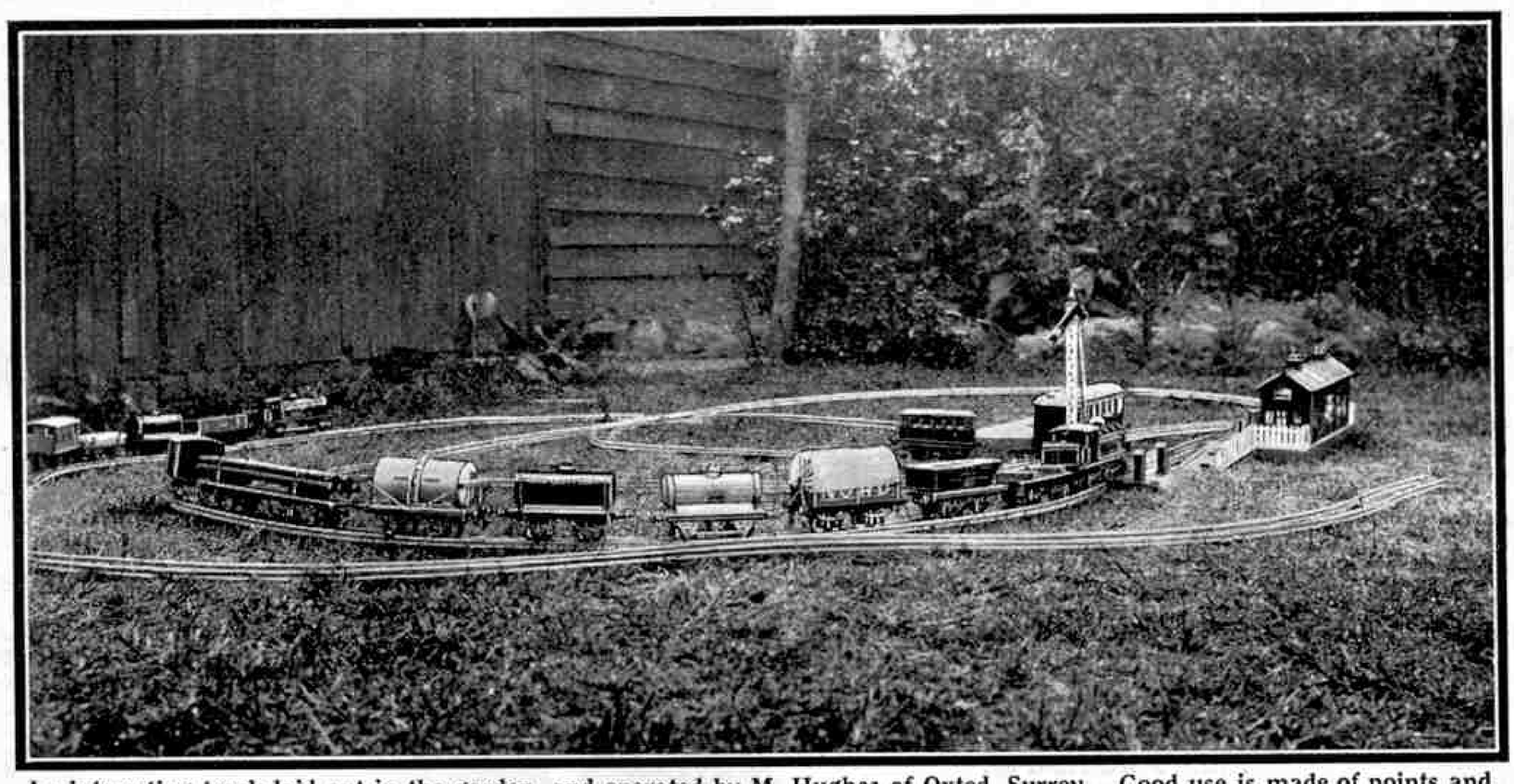
The layout of K. J. Richards of Liancourt, France. Although simple in general design, interesting running is possible, for the line consists of an oval main track with a short branch that gives access to a passenger terminus and goods yard.

The inner circular track will be found useful either for continuous running to give an alternative path to a train, either passenger or goods or for accommodating locomotives, rolling stock or complete trains when they are not required. One operating scheme that was suggested to us some time ago by a reader is to consider the circle as a "branch line" operated by one of the smaller locomotives of the Series which, apart from occasional visits to the "junction station" situated on the main track, confines its activities to numerous circuits of the inner track with a light train. Another idea, now that Curved Tunnels are available, would be to enclose most of this line in tunnel. Trains making journeys on the main line could thus be switched round the circle and through the long tunnel so formed. This would avoid the continual passage of the same tunnel on each circuit that can hardly be avoided with the ordinary continuous oval or circular track.

Again, where a train has been despatched on a long

journey, the operator may require to attend to some detail, or perhaps to deal with some goods wagons in the station which, with its yard, may be arranged where most convenient in the circumstances. The main line train for the time being may be hidden by the tunnel, the engine being stopped conveniently just outside with the coaches concealed. When ready again the operator may then release the train and carry on as before. The erection of a tunnel thus would provide a good basis for lineside and scenic effects generally.

Where the line passes in this manner through tunnels, great care should be exercised in laying the track in the first place, in order to prevent any possibility of derailment in the tunnel. These tunnels are naturally removable, so that a wrecked train can be dealt with, but considerable damage may easily result from such mishaps. The rails should be true to gauge, as measured in the well-known manner with the back of the locomotive winding key, and the joints properly made with Connecting Plates. The rails should lie flat on the surface of the floor, and if they do not do so should be gently twisted as necessary to enable them to settle satisfactorily. Attention to these details will be well repaid in the steady and trouble-free running of the locomotives and trains. Not only the tunnel section, but also the whole layout should be dealt with in this manner.



An interesting track laid out in the garden, and operated by M. Hughes of Oxted, Surrey. Good use is made of points and crossings, and two trains may be run as shown in the photograph.

Another useful scheme is shown in Fig. B. This consists of two oval main lines, one covering a larger area than the other. This feature may be useful where two engines of different capabilities are in use. In order to get them both to stop at the station, situated perhaps between the two points, the longer-running locomotive may be kept to the larger oval. On the other hand three stations may be used, one on each straight stretch of line, and some quite satisfactory working carried out. Where it is possible to assemble two trains, the fact that the length of line between the points is common to both ovals makes it necessary to avoid the conflicting of traffic in this section. Single-line working is an interesting feature of actual practice, and safety is ensured by the rigid restrictions in force, together with the use of ingenious signalling instruments specially designed for the purpose.

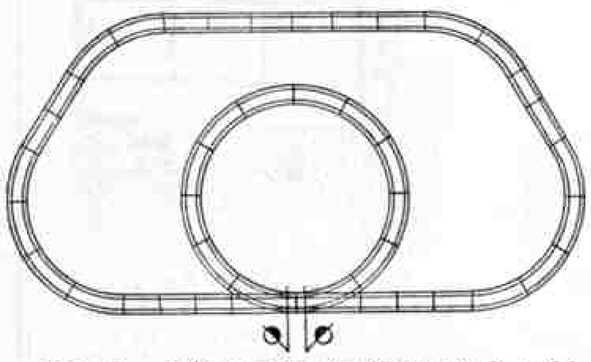


Fig. A. 2 ft. Radius (as illustrated) : 22 Curves, 16 Straights, R.H. Points, L.H. Points. 1 ft. Radius : 10 Curves, 7 Straights, R.H. Points, L.H. Points.

In miniature as in actual practice, only one train must be in any part of the section between the two points ; and if permission to occupy this is given by the train carrying a "staff" or "token," accidents will be avoided. Only one staff, possibly imitated by a Meccano 1" Rod, is used, so that both trains or engines cannot carry it at once. One train therefore must wait until the other has cleared the section and given up the staff, which is then passed to the waiting train, so that it is free to proceed.

It sometimes happens that odd points are obtained, and the layout in Fig. B is useful in showing a good method of using Double Symmetrical Points in combination with Left-hand Points. The Double Symmetrical Points lead off from the straight section we have just mentioned, and branch out into the curves forming the ends of the two ovals ; while the Left-hand Points are used to connect the two sections of the line together again, though in a different manner. Thus instead of the lines curving together, one line curves round into the other, which is straight. The variety of points available provides great possibilities in this direction, and the task of using up a miscellaneous collection of points that have been obtained from time to time is very fascinating, especially when a particular result is desired, and there are difficulties in the way of securing it.

In addition to the Points mentioned above there are the very useful Parallel Points with which most readers will be familiar. These branch out from single track and, diverging equally on each side, form two parallel tracks as their name implies. The spacing of these tracks agrees with that of the Hornby Double Track, so that these Points may be used to enable two roads to be provided at a station on layouts where the main line itself is single track. They may also be used in goods yards, and to provide access to both roads of the Hornby Engine Sheds. In order to provide as easy a passage as possible for the locomotives and rolling stock using them, they are only made with 2 ft. radius, for the reversal of direction of each branch of the Points is necessarily rather abrupt. This does not prevent their use on layouts incorporating the smaller radius curves, however, as will readily be realised.

Where Double Track is used throughout a miniature system, some means of passing from one track to the other is required, and Cross-over Points provide the necessary connection. Two sets of switch rails are involved with these Points, but they are ingeniously arranged to be operated from the same lever. This prevents any mishaps through the switch rails not being set together.

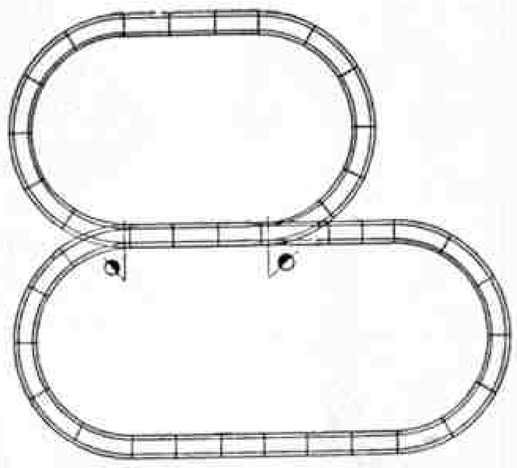


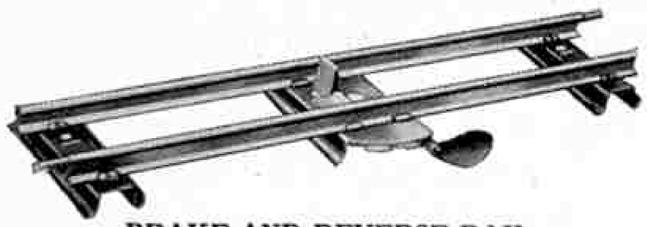
Fig. B. 2 ft. Radius (as illustrated) : 21 Curves, 14 Straights, L.H. Points, Double Symmetrical Points (Right). 1 ft. Radius : 9 Curves, 9 Straights, L.H. Points, Double Symmetrical Points (Right).

HORNBY ACCESSORIES

The range of Hornby Accessories, already comprehensive, has now been increased by the addition of a number of splendid new items. A selection of these is illustrated and described below. If you are a Hornby enthusiast you will appreciate at once the extent to which the new Tunnels, Cuttings, etc., will enhance the realism and effectiveness of your Hornby railway layout.

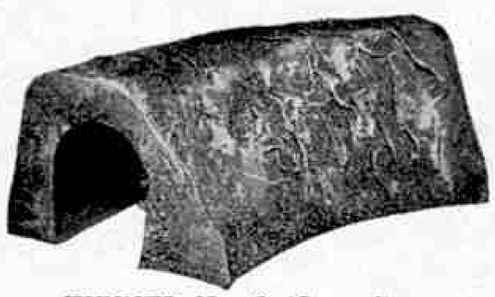
Tell your dealer that you want to see these new goods as soon as he has supplies available.

MECCANO LTD., OLD SWAN, LIVERPOOL



BRAKE AND REVERSE RAIL (HORIZONTAL TYPE)
This special rail is designed on an entirely new principle. It has independent catches for reversing or stopping the train. These are operated quite simply by means of one control lever. Price **1/6**

TUNNEL No. 0 (Straight)
Length 6 in., width 6⅛ in. Price **1/6**
TUNNEL No. 1 (Straight)
Length 7 11/16 in. Width 6¼ in. (as illustrated). Price **2/–**
TUNNEL No. 2 (Straight)
Length 15⅝ in. Width 9½ in. Price **4/–**

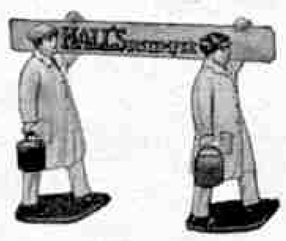


TUNNEL No. 3 (Curved)
Length 13 in. Price **4/6**
TUNNEL No. 4 (Curved)
(as illustrated)
Length 20 in. For 2 ft. radius tracks only. Price **5/6**

TUNNEL No. 5 (LEFT-HAND, CURVED)
(As illustrated)
This tunnel is in the form of a small hill, through which the track runs obliquely. For 2 ft. radius tracks. Base measurement: 15⅞ in. × 14¾ in. Length of track 17¼ in. Price **7/6**

TUNNEL No. 6 (RIGHT-HAND, CURVED)
Similar to No. 5 Tunnel, but with track in the reverse position. For 2 ft. radius tracks only. Base measurement 15⅞ in. × 14¾ in. Length of track 17¼ in. Price **7/6**

MODELLED MINIATURES No. 1 STATION STAFF
These splendid models, which are beautifully enamelled in colours, add the final touch of realism to Hornby Station Platforms. Price **2/–** per set.



MODELLED MINIATURES No. 13 HALL'S DISTEMPER ADVERTISEMENT
This miniature of a well-known line-side advertisement is intended to be placed in the fields adjoining the railway track. Price **1/–**

CUTTING No. 4 (STRAIGHT)
This is a double cutting, mounted on a base over which the railway track is laid.
Base measurement: Length 15⅝ in., width 15 in. Price **6/–**

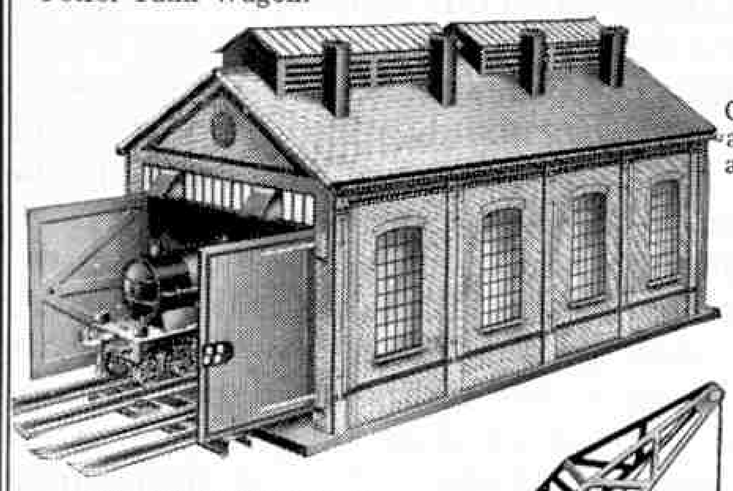
Two No. 1 and one No. 2 Cuttings are illustrated here.

CUTTING No. 1 (END SECTION)
(Illustrated)
Base measurement: Length 7 11/16 in., width 6 in. Price, per pair **3/–**

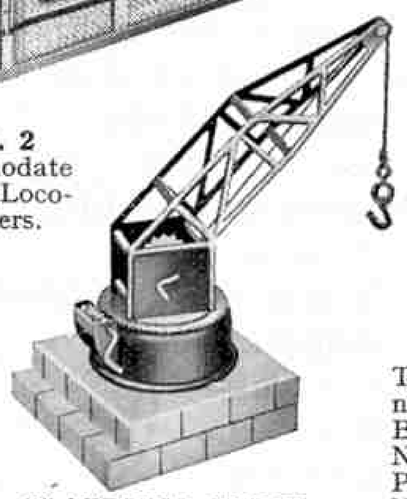
CUTTING No. 2 (CENTRE SECTION, STRAIGHT)
(Illustrated)
The addition of these centre sections enables a Hornby Railway cutting to be extended to any length. They are intended to be used in conjunction with the End Sections (Cutting No. 1), between which they are fitted.
Base measurement: Length 10¼ in., width 6 in. Price **2/–**

CUTTING No. 3 (CENTRE SECTION, CURVED)
This is used for curved tracks in the same manner as the straight centre section, described above, is used for straight tracks. It is suitable for both 1 ft. and 2 ft. radius tracks. Price **2/–**

MODELLED MINIATURES No. 21, TRAIN SET
This new miniature train set is a very attractive model. It includes die-cast Locomotive, Wagon, Crane Truck, Lumber Wagon and "Shell" Petrol Tank Wagon. Price **3/–**



ENGINE SHED No. 2
This Shed will accommodate any of the Hornby Locomotives and Tenders. Price **22/6**



PLATFORM CRANE
The Crane is fitted with a crank and ratchet mechanism. Price **4/9**

LAMP STANDARD No. 2
(Double)
Price **4/6**

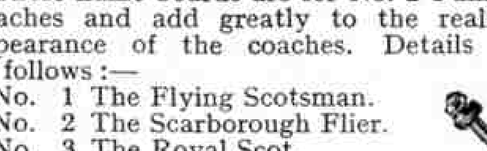
RAILWAY ACCESSORIES No. 1
Miniature Luggage and Truck.
Price, per set **1/6**

TRAIN NAME BOARDS
These name boards are for No. 2 Pullman Coaches and add greatly to the realistic appearance of the coaches. Details are as follows:—

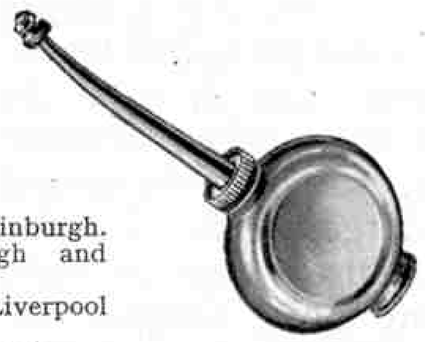
No. 1 The Flying Scotsman.
No. 2 The Scarborough Flier.
No. 3 The Royal Scot.
No. 4 The Merseyside Express.
No. 5 The Golden Arrow.
No. 6 The Bournemouth Belle.
No. 7 Cornish Riviera Express.
No. 8 Torbay Limited Express.
No. 9 King's Cross, York and Edinburgh.
No. 10 King's Cross, Edinburgh and Aberdeen.
No. 11 London (Euston) and Liverpool (Lime Street).
No. 12 London (Euston) and Glasgow (Central).
No. 13 Victoria and Dover.
No. 14 Waterloo, Salisbury and Exeter.
No. 15 Paddington, Exeter and Plymouth.
No. 16 Paddington and Bristol.

Price per packet of four of a kind, **4d.**

CLIPS FOR TRAIN NAME BOARDS
These clips are for use with coaches that are not fitted with brackets to take the Name Boards. There are two types: No. 2S, for No. 2 Special Pullman and No. 2 Special Pullman Composite Coaches; and No. 2, for No. 2 Pullman and No. 2 Saloon Coaches. Price per packet of twelve, **1/–** (either kind).

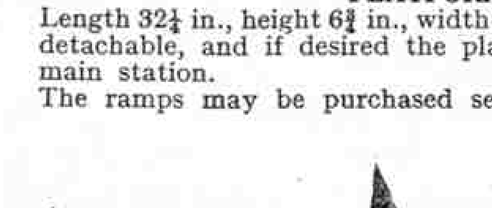


RAILWAY ACCESSORIES No. 2
Milk Cans and Truck.
Price, per set **1/6**

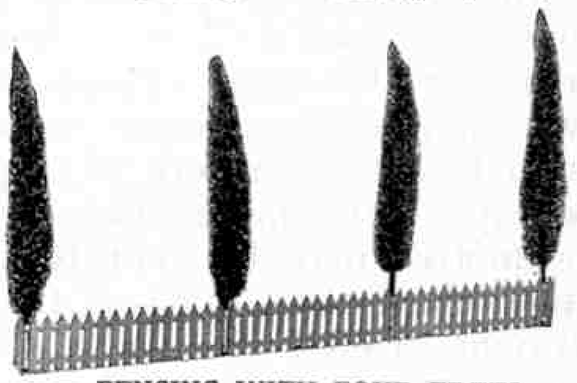


OILCAN No. 1
This new oilcan is of improved design. It replaces the No. 1 Oilcan previously listed.
Price **6d.**

SHUNTER'S POLE
Price **3d.**



RAILWAY ACCESSORIES No. 3
Platform Machines, etc.
Price, per set **1/6**



FENCING WITH FOUR TREES
This is the well-known Paled Fencing, provided with four detachable miniature trees fixed in special sockets. Price, per pair **3/6**

PLATFORM, ISLAND
Length 32¼ in., height 6¾ in., width 3 in. The ramps at either end are detachable, and if desired the platform may be connected to the main station. Price **7/6**
The ramps may be purchased separately. Price, per pair **2/6**

SIGNAL CABIN No. 2
Dimensions: Height 6½ in., width 3½ in., length 6½ in. Finished in colours. Roof and back open to allow Control Lever Frame to be fitted inside cabin if desired. Price **4/6**

RAILWAY ACCESSORIES No. 4
This set comprises all the pieces that are contained in Railway Accessories Nos. 1, 2 and 3. Price **3/9**

STATION HOARDING
This is a realistic accessory, suitable for the station platform. Price **8d.**

Station Hoarding

POSTER BOARDS to carry Hornby Miniature Posters. Provided wit lugs for attachment to paled fencing, etc. Packet of 6 (3 large, 3 small). Price **6d.**

POSTERS IN MINIATURE are reproductions of familiar national advertisements. They are intended to be pasted on the Station Hoardings or the Poster Boards described above, and are beautifully printed in full colours. Packet of 51 ... Price **6d.**

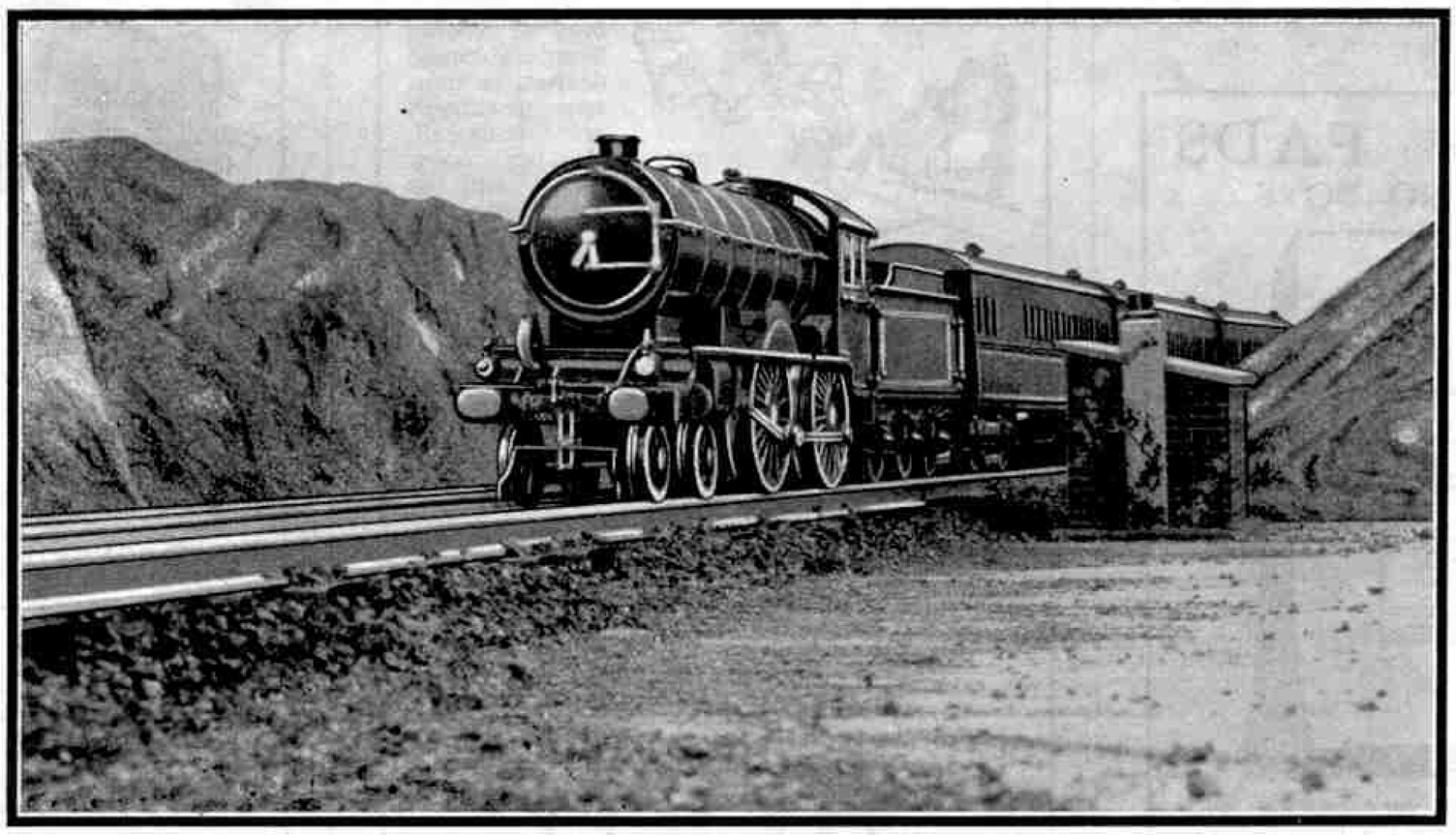
A Chat on Cuttings

By "Tommy Dodd"

A RAILWAY journey, particularly if it is a long one, makes us realise the varied nature and contour of the country passed through. The first stages of the trip through town and suburbs will probably be somewhat drab, but as the open country is reached the different features become more interesting.

The ups and downs of the track, no matter how slight, are indicated by gradient posts, and these undulations are arranged so that while as favourable a route as possible is obtained, no more heavy engineering works are involved than are absolutely necessary. It is obviously impossible to avoid such works entirely, for where the ground falls below the general level of the track the difference has to be made up by constructing an embankment, or if necessary a viaduct. Similarly, where the ground rises above the level of the permanent way, a tunnel must be bored through the eminence, or a cutting driven through it according to circumstances. Various considerations, such as the nature of the ground and its height above the formation level, have to be taken into account. In several instances, where tunnels were originally built, these have been opened out and replaced by cuttings when it has become necessary to provide additional tracks. Cofton Tunnel on the Midland section of the L.M.S.R. at Barnt Green near Blackwell, the top of the famous Lickey Incline, is an example of a tunnel dealt with in this way, a cutting having replaced the original bore, the line at the same time being widened. Where cuttings are of considerable length they are necessarily spanned by foot or road bridges. Sonning Cutting on the G.W.R. is well known for its picturesque bridges. The great depth of Tring Cutting on the L.M.S.R. Western Division main line is accounted for by the desire to maintain an even gradient on both sides of the ascent to the crest of the Chilterns, and farther along in the journey on the same line there is another great cutting at Roade, 80 ft. deep.

Cuttings occasionally give trouble when the material forming them is of an unstable nature, or perhaps as a result of heavy rains. The stretch of line on the Eastern section of the Southern Railway between Dover and Folkestone may be mentioned in this connection, for it runs in the chalk cliffs close to the sea through cuttings and tunnels. Numerous slips have occurred there, and the line has been disturbed or blocked several times. An extensive landslide took place there in December, 1915, covering a length of two miles and a width of nearly half-a-mile. A train from Folkestone Junction to Dover was stopped in time by a watchman. Trouble had been threatening for some days, and he had heard the noise of a fall of chalk. The passengers returned to Folkestone on foot, for a considerable subsidence of the track had occurred, and the train could not be run back. The extent of the disturbance was remarkable, being about 155 acres in area ; and a station known as Warren Halt was shifted bodily some 53 yards nearer to the sea. The line remained closed throughout the War period, but ultimately was cleared and public traffic was resumed in August, 1919.



Realistic cuttings are the latest addition to the Hornby Railway Accessories. They are made in sections, so as to form a continuous cutting of any desired length and, as our photograph shows, their effect is very striking.

In miniature railway practice the provision of suitable cuttings has always been a somewhat difficult problem, especially for owners of portable layouts ; but this problem is largely solved by the latest addition to the range of Hornby accessories. Following the introduction of the new Tunnels that were mentioned in these pages in December last, the Hornby Series now includes some very useful components for the making up of effective cuttings. The cutting banks are arranged in sections, so that any number of them may be placed end to end to form a long cutting, as shown in the photograph on this page. The sections are 5 in. in height, and are made in lengths equal to the length of an ordinary Hornby Straight Rail, so that they can be easily applied to any layout. Special sloping end pieces are available, in order to provide an appropriate finish at each end of the cutting, and when these are joined up to the ordinary straight sections the effect is very realistic.

The cutting sections are strongly constructed, and are finished in a special manner similar to the M Tunnels, so that they may be used to form a cutting leading up to a Tunnel of this kind. A realistic approach to the bore is thus possible, and is far more effective than the usual method more or less inevitable on portable layouts. This involves planting a tunnel down in a suitable place and leaving the rest to the imagination of the onlooker who, if he is not a model railway enthusiast and therefore aware of the difficulty, is inclined to be critical.

MECCANO MANUALS

The Meccano Manuals are all beautifully printed and the illustrations are in half-tone throughout. Every Meccano boy should possess a copy of each of the 00-4 and 5-7 Manuals, in which a total number of 889 models is illustrated, and also copies of the Standard Mechanisms and "How to use Meccano Parts" Manuals. These Manuals may be purchased as separate units, or attractively bound in full cloth cover, lettered in gold.

Prices of Meccano Manuals:

No. 00–4 Manual of Instructions ...	Price	1/9
No. 5–7 ,, ,, ...	,,	1/6
Standard Mechanisms Manual	,,	1/–
"How to use Meccano Parts" Manual	,,	6d.
Bound Manual of Instructions ..	,,	6/6

The prices of the complete range of Meccano Manuals can be obtained from your dealer, on application.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

WRITING PADS
FOR MECCANO BOYS

These Writing Pads are very popular with Meccano boys as is shown by the large number of letters we receive each day written on the familiar tinted paper.

The Pads are supplied in two sizes, each consisting of 50 sheets and cover.

Prices—Large Size 1/- each (post free). Small Size 6d. each (post free).

ENVELOPES.

Special envelopes, appropriately printed and matching the writing paper in colour, are also available. These are suitable for both the large and the small sheets of writing paper.

Price, per packet of 50, 8d. post free.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

Meccano No. 5 Outfit Cabinets OS

We have available a limited quantity of these Cabinets that are not quite suitable for the latest No. 5 Outfit contents and are therefore being disposed of at a bargain price.

The No. 5 Cabinet OS is strongly-built of oak and is exquisitely finished. It is made in two sections, upper and lower, each of which is fitted with wooden partitions. The cabinet is provided with lock and key.

Dimensions:

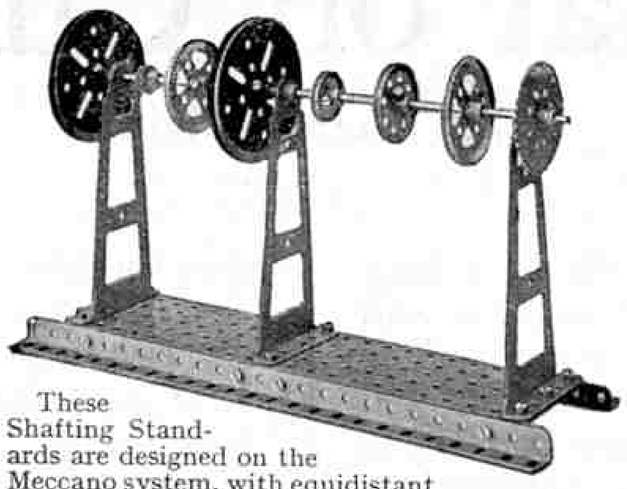
Length 17¼". Width 12¼". Depth 3⅛".

REDUCED PRICE 25/–.

Postage 1/3 extra. Previous price 35/–.

This Space is set to ½ inch s.c. and costs 8/– per month. The sum is the 50th of £20, the price of a whole page advertisement. Over 90,000 copies of the December number were distributed all over the world. You therefore reach this exclusive public for approximately one penny a thousand.

MECCANO SHAFTING STANDARDS

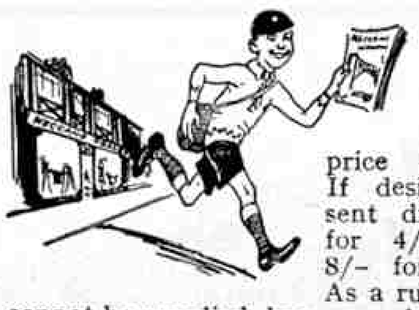


These Shafting Standards are designed on the Meccano system, with equidistant holes. Our illustration shows how strong and serviceable shafting may be constructed from Meccano parts with the aid of the Large Standard.

Standard only, Large (Part No. 177) Price 1/–
,, ,, Small (,, ,, 178) ,, 8d.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

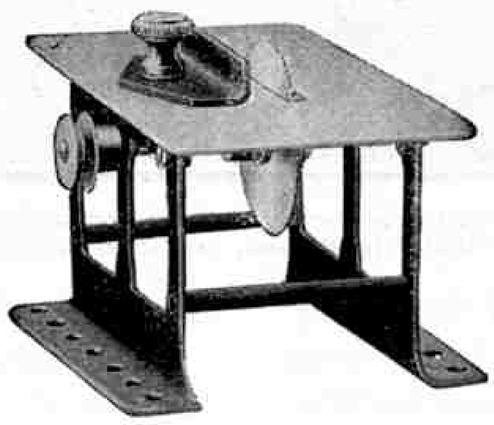
How to obtain the "M.M."



The "*M.M.*" may be ordered from all Meccano dealers, or from any newsagent or bookstall, price 6d. per copy. If desired it will be sent direct, post free, for 4/– for six, or 8/– for twelve issues. As a rule back numbers cannot be supplied, because only sufficient copies are printed to fill standing orders. To prevent disappointment, therefore, place a regular order with your dealer, newsagent, or the publishers—

"Meccano Magazine," Binns Road, Old Swan, Liverpool.

MECCANO SAW BENCH



This model Saw Bench is suitable for use with an Electric or Clockwork Motor or Steam Engine. By means of the equidistant holes in the base it may be built into a Meccano Model Workshop. Beautifully finished in black enamel and nickel. Price 4/–.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

"MECCANO MAGAZINE" SPRING BACK BINDER

There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply.

These binders have strong stiff backs, covered with black imitation leather, tastefully tooled, and are lettered in gold. The large binder holds 12 Magazines—price 4/6 post free. The small binder holds 6 Magazines — price 3/– post free.

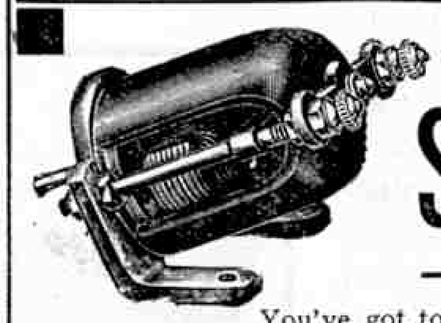
Meccano Ltd., Old Swan, Liverpool.

How to Model

A Lion, Bear, Camel, Elephant, Horse and Cat, Cow and Goat

AN ENTIRELY NEW SERIES
6d. each or post free 9d.

HARBUTT'S PLASTICINE LTD.
99, BATHAMPTON, BATH



THAT'S SPEED —THAT WAS

and only 8/6 Post Free

You've got to see this **MOTOR BOAT ENGINE** working to appreciate the speed it develops. It's a racer! Just the sort of thing you want. Runs quite cheaply from an ordinary Torch or Flash Lamp Battery. Send for one before you forget. Easy to fix. Can also be used for driving Meccano Models.

Postage abroad 1/– extra.

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GHOST TRAINS

Brilliantly luminous in the dark.

Only 1/– each, post 1½d. Guaranteed free from dangerous chemicals, and to last for years.

SYLVESTER (Dept. C), Narborough, Leicester.

BOYS MAKE YOUR OWN LEAD SOLDIERS

Cowboys, Indians, Animals, Zulus, Model Farmyard Sets, Rodeo, etc. Our CASTING MOULDS make thousands from any scrap lead WITHOUT PREVIOUS EXPERIENCE. Send stamp to-day for Illustrated Catalogue. Complete mould ready for work 3/–. **J. TOYMOULDS, 7, Jamacia Row, Birmingham.**

Mention "Meccano Magazine."

Suggested Hornby Train Improvements

LINESIDE BOUNDARIES

The railway companies in this country are compelled by law to enclose their property—which is of course private—and they have to erect and maintain in proper condition the necessary fencing or walls for this purpose. It is therefore an offence to trespass on the railway, and the effect of these regulations is seen in the marked safety of British railways in this respect, and in the generally well-kept arrangement of their tracks and properties.

When a miniature system is laid down it has a very unfinished appearance until some form of boundaries are provided in order to separate the railway property from the "landscape." Owners of permanent railways frequently make their own fencing, but where a whole system is involved this is apt to be a tedious process. The common "post and rail" fencing is difficult to imitate in a satisfactory manner, and a solid "board" fence never looks very convincing. A modern development is the use of reinforced concrete posts through which several lengths of wire are passed to form the rails of the fence. From the miniature point of view this has not a very attractive appearance, and considerable trouble is involved in drilling some half-a-dozen holes in each of the thin posts, which probably are made of wood.

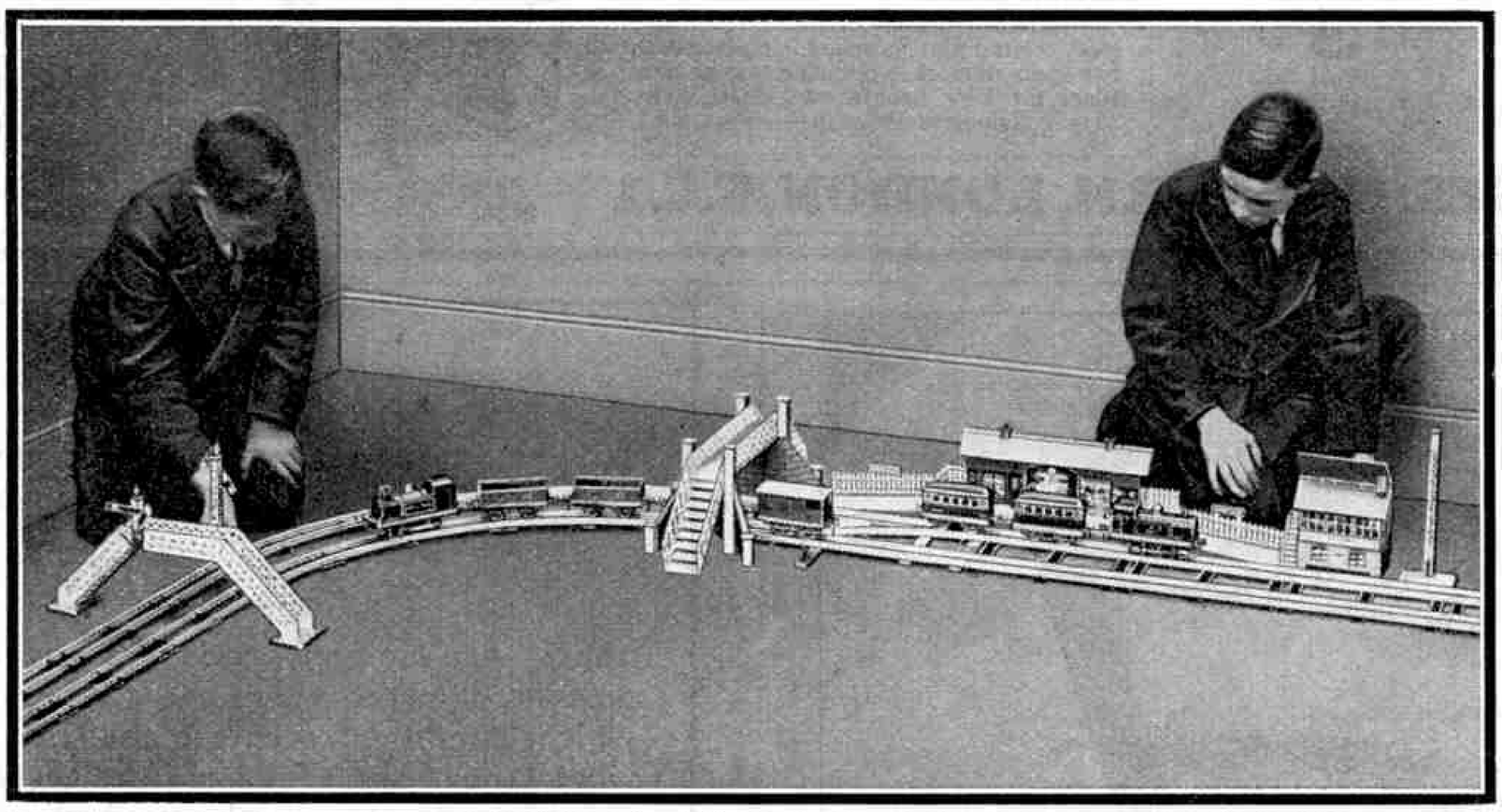
Fortunately a very effective form of Paled Fencing is available in the Hornby Series. This, as its name implies, imitates the type of fencing commonly used on station platforms and round goods yards and railway property generally. It is supplied ready fitted to the platform of the Railway Station No. 2 and its ramps, and a length is provided also with each section of Passenger Platform. It is attached to the latter by standard Meccano bolts and nuts, holes being pierced in the bottom flange of the railing to correspond with holes provided in the Platform itself.

Separate lengths of Paled Fencing may be obtained, and an interesting point is the manner in which these lengths are now made adaptable for all portions, straight or curved, of the layout that it is required to enclose. The bottom flange is reduced in width between the projections that are intended for the bolts just mentioned. This enables the fencing to be bent into the various curves that may be required in different places, and an additional advantage is that it may be bent and re-bent to suit different situations, thus allowing for changes in the formation of the line.

ARTICULATED COACHES

A notable feature of recent railway practice is the spread of the principle of providing articulated connections between coaches, supporting their adjacent ends upon a common bogie. This scheme was introduced on the G.N.R. more than 20 years ago, and it has been widely applied on the L.N.E.R. group, of which the G.N. forms a part. It has extended to the Great Western Railway, and it is also applied abroad. Even the rail-motor coach has been arranged to incorporate the articulated principle. The closer coupling of the vehicles enables a certain amount of space to be saved in the make-up of a heavy train; and as the adjacent ends are carried on the same bogie, the lost motion between the two coaches is much reduced, and the running on the whole is smoother and steadier. Numerous sets of dining and sleeping vehicles, in which steadiness is an important feature, have been put into service on the L.N.E.R.

It has frequently been pointed out that the Hornby Series contains no articulated coaches, and that in order to keep abreast of modern developments these should be included. This matter is under consideration, and in the meantime miniature railway owners who follow the L.N.E.R. and have Hornby No. 2 Saloon Coaches will find the following scheme useful.



Two Hornby railway owners busy with their layout. A double-track main line is in use, and the Footbridges shown add considerably to the general effect.

When it is decided to articulate two of these vehicles, the bogies and couplings at the ends to be united are removed. The eyelets securing the couplings should have their turned-over edges bent in with pliers, and then be pushed out of place, thus freeing the couplings. The buffers at the ends concerned are removed by twisting them out of place, and the buffer beams are trimmed level with the bottom of the slot through which the couplings normally pass. This trimming may be accomplished with an old pair of scissors. Two Meccano 3" Strips are then used to form the hinged connection between the two coaches. Each Strip is laid on the floor of the coach, so that it projects over the end, the second hole in the Strip coinciding with the end of the coach. These Strips are then cranked or bent so as to be fastened to the threaded portion of the bogie pins, while still maintaining their amount of projection.

The coupling-controlling wire is removed from one of the detached bogies, and the raised pivot-block in the centre of the bogie frame is taken off the top by gentle prising of the lugs, and replaced below the bogie frame. The distance thus left between the Strips at floor level, and the top of the bogie frame is made up by a Meccano 1" Loose Pulley. This is laid centrally on top of the bogie, and the lugs of the pivot-block are closed down over its lower flange, thus maintaining it in its correct position. A trial assembly should then be made with the Strips fixed in position on the coaches, allowing the holes in their outer ends to meet over the bogie centre. Slight adjustment of the Strips may be necessary to bring the two coaches to the same height.

The "pin" used to pivot the bogies through the two Strip ends is the shank of a Meccano Spring Buffer. This is passed up through the bogie from below, and the shoulder by the head of it will be found to fit the hole in the reversed pivot-block, while the shank passes through the Pulley and Strips and is secured by lock-nuts. This connection should allow plenty of room for the movement of the bogie, so as to compensate for any irregularities in the track. After any necessary adjustments have been made, it is better to detach the parts from the coaches and fit up the Strips to the bogie, as the lock-nuts can thus be dealt with better. A Corridor Connection should be used between the coaches, and to prevent it from being too stiff it should be pressed tightly several times to remove some of its springiness. If the coaches are now placed on the table upside-down, the fitting of the articulating bogie unit may be carried out with ease. The Strips should pass exactly along the centre of the vehicles, and be securely nutted to the original bogie pins so that they cannot move sideways.

We now have a two-coach articulated unit that will negotiate 2 ft. radius curves and points quite satisfactorily. Its riding, as compared with two separate coaches, is steadier, and it will add considerably to the effect of an L.N.E.R. train. Readers who experiment upon these lines will, we are sure, be very pleased with the results.

No. 1 SPECIAL LOCOMOTIVES WITH INSIDE CYLINDERS.—Your suggestion is interesting. We agree that the usual British goods engine has inside cylinders, and to some extent the type could be represented by a No. 1 Special, modified as you suggest by the omission of the cylinders and steam pipes. At the same time you must not forget that the large number of outside-cylinder mixed-traffic engines now in use on all four groups are well represented by the No. 1 Special as it stands. Further, the new No. 0 Locomotive has no outside cylinders, and we think this will fulfil your purpose in a satisfactory manner. (*Reply to J. Hope, Derby.*)

ADDITIONAL TRAIN NAMEBOARDS.—The present range of Nameboards is only a beginning, and it is obviously impossible to provide at once for all the well-known expresses that are run on the four groups. If we find that there is a sufficient demand for extra Boards, we shall consider their introduction. (*Reply to H. Horne, Rugby.*)

CONTROL POINTS.—Although Parallel and Double Symmetrical Points fitted for control are not listed, they may be obtained at the same price as the existing type by ordering them specially. These Points are not in such demand as the ordinary turnout, so that we have not found it necessary to make special provision for their manufacture. Existing Points can be adapted without much difficulty, and the method to be employed was dealt with on this page in December last. The special Control Sleeper and Bell Crank used for the purpose costs 10d., post free. (*Reply to C. Lee, Bushey.*)

BOYS! Get All Your Model Boat Needs From GAMAGES

Special Demonstrations of Model Boat-building will be given in the Store from April 4th to 9th.

We stock all Hornby Trains and Meccano Parts and can give prompt delivery to all parts of Britain.

We Specialise in the Latest Craft

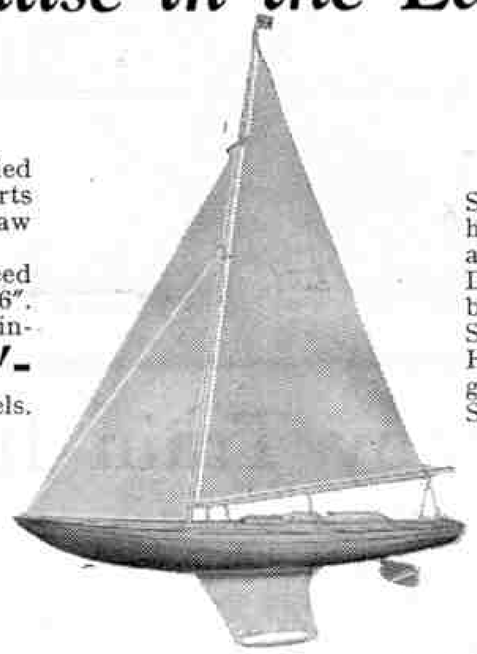
Build Your Own Yacht and Speed Boat

Any boy of normal intelligence can, by following the directions supplied with these outfits, construct a beautiful model yacht from the parts supplied. The directions show exactly how everything is made. Fretsaw patterns and all the necessary parts are provided.

MODELS.—21" Model Sailing Yacht, Bermudian Sloop. Complete set of parts and instructions. Price **21/-** Post 9d.

SPEED BOAT.—Model Speed Boat. Length overall, 26". Complete set of parts and instructions with small engine (Clockwork). Price **30/-**

The illustrations are from actual photographs of completed models.



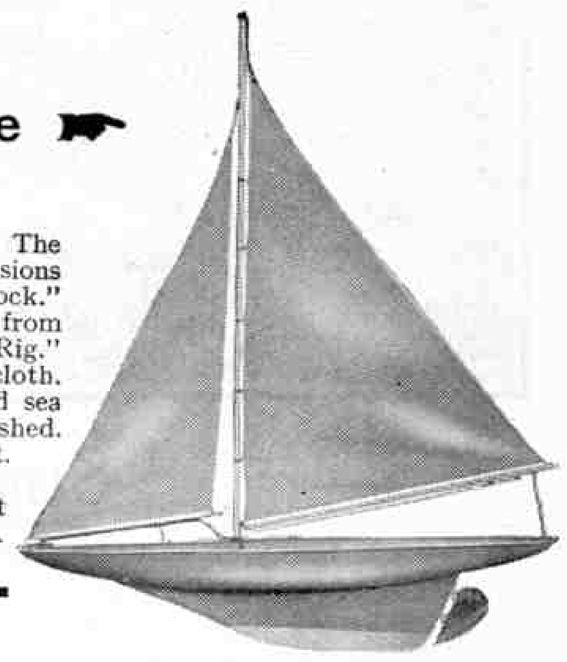
Shamrock Type Sailing Yacht

Specially made for Gamages. The hull is correct to scale in dimensions and profile of the latest "Shamrock." Deck is cambered, hull carved from best yellow Pine, "Marconi Rig." Sails made from Spinnaker cloth. Hull of the Yacht is enamelled sea green. Deck is lined and varnished. Stand supplied with each Yacht.

No. 1.

Length	Beam	Depth	Weight
27"	4½"	5½"	2½ lbs.

Price **30/-** Carriage paid.



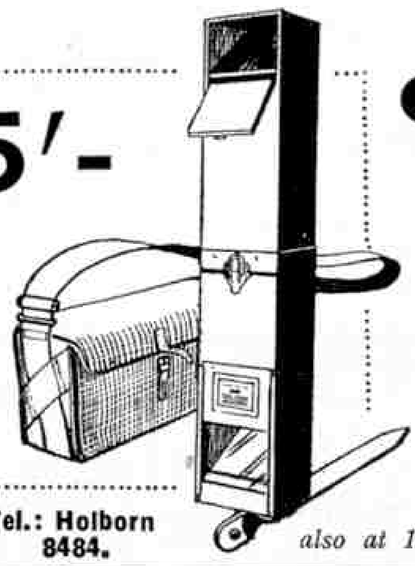
The Boy's Own Telescope

Strong Brass Telescope, well made. It gives high magnification. A very useful instrument and indispensable for the outdoor boy.

1 Draw Price **3/-** Post 3d.
2 Draw ... Price **3/6** Post 3d.
3 Draw ... Price **4/6**, Post 3d.

BOYS! REAL EX-ARMY PERISCOPES FOR ONLY 5/-

Every boy is fascinated by the Periscope. And now is a chance to secure the "real thing" at an amazingly low price. These instruments are ex-Army stock. Strongly constructed in wood case, with optically corrected mirrors and prism. Fitted with steel ground pin. Supplied complete with two spare mirrors in portable canvas case. Ideal for Boy Scouts, etc. Originally 50/-. Gamages Price **5/-** (Post 6d.).



GAMAGES GREAT CRICKET WEEK April 4th to 9th

Come and practice with world-famous Cricketers. We have reserved a special net for boys and visitors will be at liberty to discuss their Cricket problems with

G. GEARY,
P. HENDREN,
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GAMAGES, HOLBORN, LONDON, E.C.1 Tel.: Holborn 8484.

also at 107, Cheapside, E.C.2.

Callard & Bowser's Butter-Scotch

AIRTIGHT 6D. & 1/- TINS

and in the original packets

1d. 2d. 6d. & 1/-

CALLARD & BOWSER LTD., DUKE'S ROAD, LONDON, W.C.1.

WHY

do Lemons and Oranges make most refreshing and delicious fruit drinks?

ALL BOYS

know that Lemons and Oranges are grown in pleasant climates where there is plenty of sunshine, which, combined with the soil, makes these fruits what they are, full of healthgiving qualities, especially vitamins, without which we cannot grow and be strong. All boys (and all girls, too)

LIKE

fresh Lemonade and Orangeade made from Kia-Ora because they know Kia-Ora is made from the finest of fresh fruit and Tate and Lyle's cane sugar.

All Boys and Girls know that it is only necessary to add five or six parts of water to one of Kia-Ora to make the drinks they like best; therefore, when Mother is ordering Squash please ask her to say

KIA-ORA

Sold Everywhere

Large Bottles, 2/-. Full Half Bottles, 1/1

KIA-ORA LTD., Blackfriars, London, S.E.1

IT PROBABLY WAS!

Mrs. White had been rather suspicious of the quality of the milk for some time.

"Look at this milk—it's disgraceful!" she exclaimed one day.

"What's the matter with it, mum?" asked the milkman in surprise. "It looks as right as rain to me?"

* * * *

Chambermaid: "What time shall I wake you in the morning, madam?"

Haughty Guest: "I will ring for you when I wish to be awakened."

* * * *

The doctor was very serious. "I have bad news for you," he said. "You will never be able to work again."

"That's all right, said the invalid after a pause. "Now tell me the *bad* news."

* * * *

Hostess: "Miss Blank, this is Captain Steelson. He has only just returned from a very long stay in the Arctic regions."

Miss Blank: "Oh, *do* come nearer the fire, Captain, you must be *so* cold."

* * * *

Tenant of new house: "Why there's grass coming up between the boards in the drawing room."

Landlord (unperturbed): "Grass? Oh, we'll soon fix that. I'll send my man round with a lawn mower."

* * * *

Stage Manager: "Good heavens! the audience is laughing! Has that comedian actually made a joke?"

Stage Hand: "No, it's only a bit of scenery fell on 'is 'ead."

* * * *

The tramp was in trouble for begging.

"I'm not lazy, sir," he whined to the magistrate. "I just can't get work."

"Look at his hands, sergeant," said the magistrate.

"This man 'asn't done any work for a long time, sir," said the sergeant a few moments later. "His hands are as soft as mine."

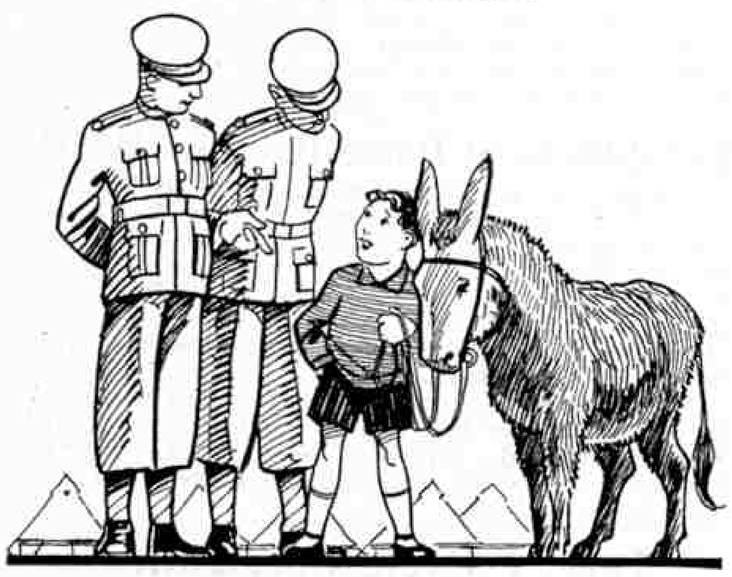
* * * *

Mistress (to maid): "And mind you clean all the brass before you go!"

Maid (under notice to leave): "I have, ma'am—all but your rings and bracelets."

* * * *

ALL BROTHERS!



"Why are you holding on to your brother so tightly?" asked a soldier of a small boy leading a donkey past an army camp.

The boy was not abashed.

"So that he won't join the army," he retorted.

* * * *

"I really enioyed myself at the dentist's to-day, Jim," said Fred.

"Enjoyed yourself?" repeated Jim in astonishment.

"Yes," said Fred. "When I got there my dentist was having his teeth extracted by another dentist."

BOTH IN THE FINAL

The man in the jeweller's shop had purchased one or two small articles, when he glanced at a row of large silver cups displayed on the counter.

"Those, sir," said the jeweller, "are the cups to be awarded as prizes at the sports on Saturday."

"Well," said the customer, grabbing one and making for the door "suppose you race me for this one."

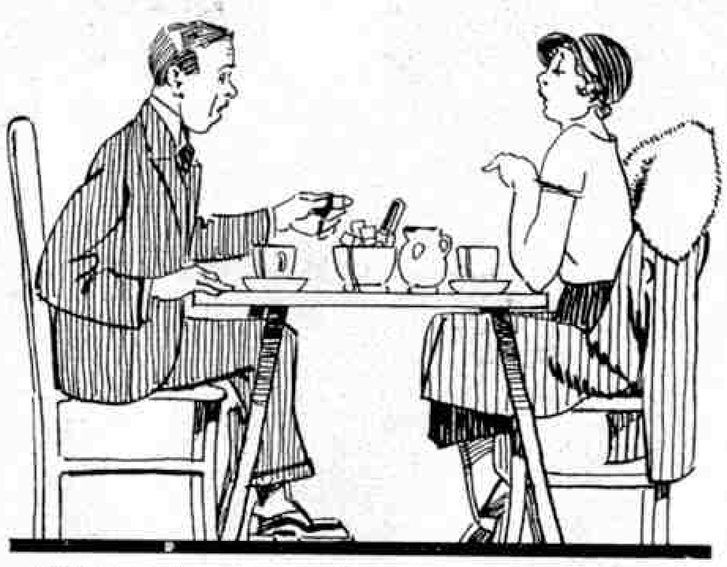
* * * *

Little boy (to confectioner): "Please, sir, mother said will you change these buns. They've got a soapy taste."

Confectioner: "Well, what do you expect? They're bath buns."

* * * *

A COOL HAND



"'Enery, 'ow can you be so common as not to use them there tongs?"

"Eh? What's the matter with you. The sugar's not 'ot!"

* * * *

Teacher: "Brown, give me the name of an animal peculiar to New Zealand."

Brown: "The elephant, sir."

Teacher: "The elephant, indeed. The only elephants in New Zealand are in circuses and menageries."

Brown: "Well, if one was found wild there, it would be peculiar, wouldn't it. sir?"

* * * *

Father (sternly): "Henry. I promised to give you a bicycle for your birthday if you passed your examination. Now I see that you have failed. You should have studied more at home. What have you been doing in your spare time?"

Henry: "Learning to ride a bicycle, father."

* * * *

Jim had been boasting about a pair of waterproof gloves in his possession.

"What use are they?" demanded John.

"Oh," said Jim, "I can wash my hands now withou getting them wet."

* * * *

Billy had been forbidden to fight.

"Where did you get that black eye?" his mother demanded when he came home.

"I was protecting a little boy," said Billy.

"That was very good and brave of you. But who was the little boy?"

"Me."

* * * *

Rambler: "Is it far to the next village?"

Yokel: "Well, it seems further'n what it be, but it bain't."

* * * *

Landlady: "What's this? Has Mr. Black found something fresh to complain about?"

Maid: "No, mum; it's the eggs this time."

A SOUND REASON

The amateur singer's voice had been tested by a famous professor.

"I'm sorry you don't think much of my voice, Professor," she said. "As a matter of fact, my neighbours all tell me I ought to go to the Continent to study."

"That may be," replied the Professor. "But you see I don't happen to be one of your neighbours."

* * * *

Visitor: "I'm glad to hear that you're out of danger, old man."

Invalid: "I'm not yet. The doctor says he'll have to call two or three times yet."

* * * *

Mike had obtained work as a blacksmith's assistant, and his employer told him that if he wished to make a good blacksmith he would have to learn to do exactly as he was told.

"Now, I'm going to bring this horseshoe from the fire and lay it on the anvil," said the blacksmith. "When I nod my head, hit it hard with the sledge-hammer."

* * * *

Teacher: "Brown, what is a primeval forest?"

Brown: "Er, it's a place where the hand of man has never set foot, sir."

* * * *

Passenger: "Be careful. This hill is very dangerous!"

Driver: "I can't slow down, the brakes aren't working."

Passenger: "You don't mean to say . . ."

Driver: "Oh, don't get excited, the horn's all right."

* * * *

Forger: "But, yer worship, I couldn't 'a done it. I can't even sign my own name."

Judge: "You're not charged with that."

* * * *

The sheriff in a little western American town also acted as the veterinary surgeon.

"In which capacity is my husband required?" his wife one day asked over the telephone. "As sheriff or veterinary surgeon?"

"Both," came the reply. "We want him to open our bulldog's mouth and then to arrest the burglar caught in it!"

* * * *

NO ENTERTAINMENT TAX

Condescending and over-dressed tourist (to old Scotsman): "And don't you ever go up to London to see the sights?"

Scotsman: "Na, na. We just bide a wee, an' a' the sights o' Lon'on come tae the Hielan's."

* * * *

Plumber (to his mate): "See if I've left anythink be'ind, Bill."

Mate (after casual survey): "No, everythink's 'ere."

Plumber: "'Ow absent-minded of me!"

Surgical Operations to Ships—(*Cont. from p. 265*)

good deal of the structure adjacent to the nearest joint of plate or girder on each side of the gaps.

These operations, together with the reconditioning of the two ends, which was carried on concurrently with the joining, and the sliding back of the bridge structure and the coupling up of all fittings, etc., occupied a month, and then the vessel was ready for her final undocking as a complete and rejuvenated unit.

It need hardly be said that such an enterprise, apart from its first conception and planning, involved a great deal of hard thinking by many people. Behind the elaborate practical operation lay the calculations of a highly-trained scientific staff, who had thought out the details and worked out and successfully solved the technical problems in regard to trim and stability. For instance, before launching the midship section there were many interesting discussions on the launching of a flat-ended structure, which presented problems quite unlike those met with in the case of an ordinary sharp-ended ship. These problems were finally settled by means of small-scale experiments, and working from known successful launches, satisfactory means of launching the peculiar midship part were devised.

The "*Cadillac*" has now been trading for over a year since her grafting operation, and in that period has carried more than 32½ million gallons of oil. She is now as free from the prospect of repair bills and delay as a new ship would be. The second ship, the "*Saranac*," was dealt with in a similar manner and with equal success.

Get More Fun—(*Cont. from page 303*)

platforms will of course be a factor in this question. The "kitchen" portion of the vehicle, representing the dining car, or the whole "kitchen car" where rolling stock is plentiful, may have its windows covered by a strip of tissue paper.

Interesting goods working in addition is possible on the layout, for trains may arrive over the East and West curves of the triangle and be dealt with in the yard adjacent to "Manchester." Sidings of course may be laid down at "Derby" or elsewhere when space permits. After marshalling the wagons in fresh formation, trains may leave for the south in a realistic manner. Coal and mineral trains are dealt with in large numbers on the Midland, and the necessity for handling the traffic economically over the heavy gradients explains the use of the 33 "Garratt" articulated locomotives on this section of the L.M.S.R. Although no such spectacular locomotive yet exists in the Hornby Series, good use may be made of the No. 1 or No. 1 Special Locomotive to represent the numerous and useful "Moguls" or 2–6–0 mixed traffic engines. The inside-cylinder Midland pattern goods engine, of which there are so many now in use, may be represented by the new No. 0 Locomotive in L.M.S.R. style, in exactly the same way as suggested for the G.W.R. "2251" engines last month.

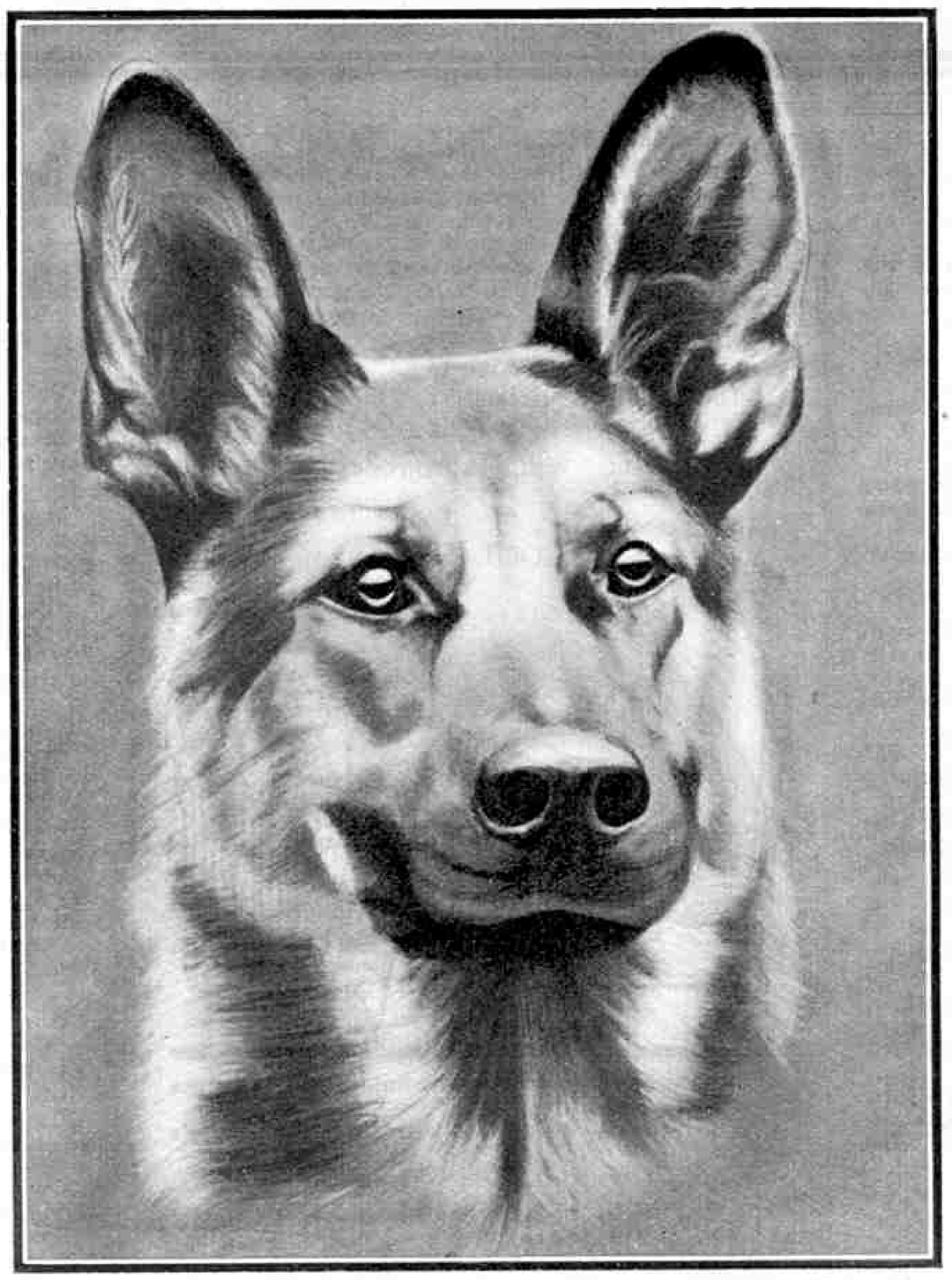
Electro-Gravity Points—(*Continued from page 258*)

thrown is regulated by the agency of a dashpot, comprising an oil-filled cylinder, the piston of which is connected to a crank in the main driving shaft. The oil transfer port may be varied to adjust the buffering effect of the dashpot to suit local requirements.

The circuit is arranged to provide for the energisation of the safety electro-magnet in advance of the release electro-magnet. These electro-magnets are so associated with the mechanical release that both must be actuated in the appropriate sequence before the points can be thrown. In the event of any irregularity, such as the release magnet being improperly actuated by false current, or by vibration, the safety magnet would engage the release bar, prevent any points movement, and render the equipment inoperative until the machine had been reset by hand.

If the travel of the machine should be arrested in an intermediate position as the result of obstruction by snow, coal, etc., no damage to the machine would follow, and steps would have to be taken to remove the obstruction in order to resume normal working. For emergency working of the points, in the event of machine or circuit failure, a ground frame lever is provided in such a position that the points rod may be transferred to it for manual inspection.

As compared with low-voltage electrically operated machines, it is claimed for the Sheremeteff machine that the operating time is decreased. Even more important is the economy in working. There is no expenditure for installation or maintenance of power, battery costs being negligible.



This splendid pencil drawing of an Alsatian, by E. A. Boughey, Herne Hill, London, S.E.24, won first prize in the senior (Home) section of a recent contest in which competitors were asked to submit drawings of their pets.

New Meccano Models—(*Continued from page 293*)

The model Oil Tanker shown in Fig. 6 has a particularly neat and graceful appearance, while in its design it follows closely the proportions of the type of vessel that is now extensively used for the bulk transport of petroleum. Many of these vessels carry more than 20,000 tons of oil.

The assembly of the hull of the model is clearly shown in the illustration and the construction should not present any difficulties. The small fuel tanks that are used to supply the engines of the vessel are represented by Boiler Ends. A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is secured to the centre holes of the Boiler Ends, and the Angle Strip in turn is attached to the hull by a Double Angle Bracket. Two $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Brackets are secured in the positions shown to complete the frame. Both masts are supported in the bosses of Cranks secured to the deck of the vessel.

The Meccano Oil Tanker contains the following parts:—10 of No. 1; 17 of No. 2; 6 of No. 3; 1 of No. 4; 12 of No. 5; 2 of No. 6a; 8 of No. 8; 8 of No. 10; 3 of No. 11; 10 of No. 12; 2 of No. 12a; 1 of No. 13; 2 of No. 15a; 2 of No. 35; 94 of No. 37; 6 of No. 37a; 1 of No. 38; 1 of No. 40; 1 of No. 45; 1 of No. 46; 2 of No. 48; 8 of No. 48a; 1 of No. 48b; 2 of No. 52; 3 of No. 53; 2 of No. 54; 2 of No. 62; 1 of No. 63; 2 of No. 90; 2 of No. 90a; 6 of No. 111c; 4 of No. 125; 1 of No. 147b; 1 of No. 162.

Model-Building Contest at Wallasey

A special feature of this year's Annual Conversazione of the Grammar School, Wallasey, Cheshire, was the introduction of a series of hobbies contests, in which there was a special class for Meccano models and Hornby Train layouts. The models included in the large number of entries in this section displayed a very high standard of constructional skill, while ample knowledge of the manner in which real railway features could be reproduced on a miniature track was evident in the Hornby Train layouts on view.

Three prizes were awarded in the Meccano and Hornby Train section, in which the models were judged by a special representative of Meccano Ltd. The first was won by J. W. KNOWLES, who showed an excellent Stiff-Leg Derrick in which the movements of the prototype were splendidly reproduced, the speeds of the moving parts being splendidly proportioned. The second prize was awarded to E. R. BARLOW, who showed a very neat Block-setting Crane, and T. DRINKWATER secured the third prize with a Tipping Hoist for coal wagons.

Exhibition of Passe Partout Work

Readers who are interested in Passe Partout work, and will be in London between 12th and 16th April, should make a point of visiting Dorland House, Regent Street, S.W.1, where Messrs. Samuel Jones & Co., the makers of the well-known "*Nulli Secundus*" brand of Passe Partout materials, are holding an exhibition of the entries to their Competition that closed on 31st March.

Admission is free on production of an invitation card that may be obtained on request from Samuel Jones & Co. Ltd., Bridewell Place, E.C.4. Readers who write to Messrs. Jones should make a point of mentioning the "*M.M.*"

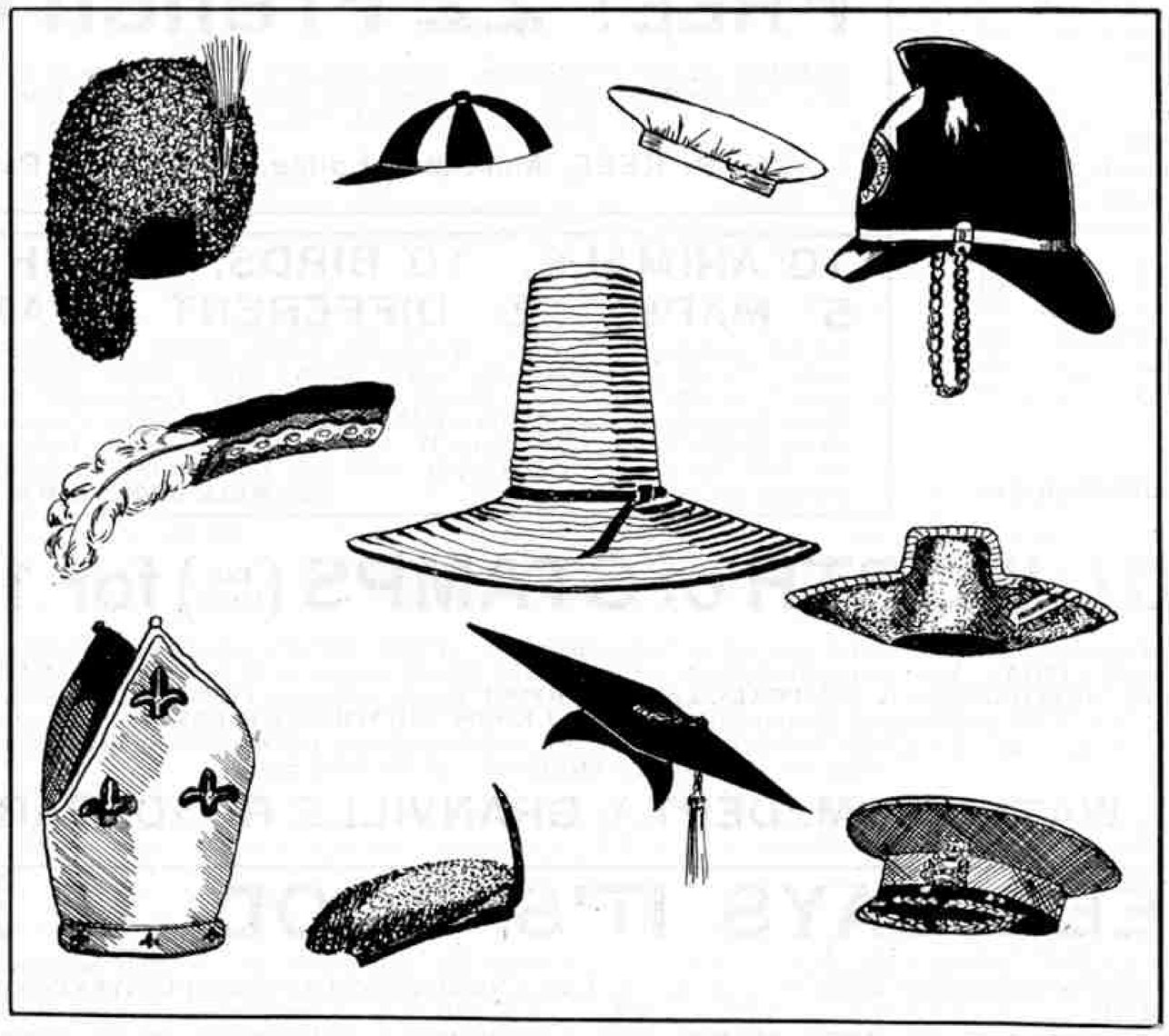
Terry's Cycle Specialities

At this time of the year thousands of "*M.M.*" readers are overhauling their bicycles, replacing worn or defective parts, and considering the addition of various devices to make their summer cycling excursions more enjoyable. We advise all such readers to write to Herbert Terry & Sons Ltd., Redditch, for a copy of their splendid list of cycle specialities, which will be sent free on mentioning the "*M.M.*" This list includes items of interest to every cyclist, for this firm has long specialised in spring gadgets designed to add comfort to riding under all conditions.

Competition Page

FIT FACES TO THESE HATS : A NOVEL CONTEST

At a party we attended at Christmas it was necessary for each of the guests to attend in a costume of bygone days, and as may be imagined, many striking effects were achieved. The feature that occurred to us however was that a surprising number of the guests had only very hazy ideas as to the names of portions of the costumes worn by their fellow revellers. Some extraordinary mistakes were made, and we could not help thinking that few of our readers would have "tripped up" quite so easily. From that thought it was but a short step to this month's competition.



To make the idea perfectly clear, we must explain that our illustration displays a number of hats, including both medieval and modern specimens. Readers are required to identify each of the hats—we use the term *hat* as a simple reference to all forms of head covering—by stating the occupation of the wearer and the approximate period of history at which it was commonly worn, and then to sketch typical heads and shoulders fitted to each hat. Sufficient of the upper part of the body should be included to display the uniform or style of dress usually worn with the hat.

It should be understood that although a certain allowance will be made for the quality of the drawings, this will not be the determining factor in the judging. It is much more important that the identification of the wearer of each hat shall be accurate. Thus the boy who is not good at drawing will not be penalised.

Prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the four best entries in order of merit, and in addition there will be a number of consolation prizes that will be awarded at the judge's discretion.

Entries should be addressed to "Hat Contest, Meccano Magazine, Binns Road, Old Swan, Liverpool," and must reach this office not later than 30th April.

For the benefit of Overseas competitors a duplicate set of prizes will be reserved for readers living outside the United Kingdon and the Irish Free State. The closing date for Overseas entries will be 30th July.

Readers who wish to finish their drawings in colour and those who for other reasons do not wish to mutilate their copies of the "*M.M.*," may copy or trace the hats on to a separate sheet of paper. It is not essential to use the illustration given here; indeed, many competitors probably will prefer to work on a somewhat larger scale, and we must make it clear that there is no objection to that course.

April Photo Contest

There is little that need be said by way of introduction to "*M.M.*" photographic contests, as they are so simple in conception. Nevertheless, for the benefit of new readers it is necessary to make clear that each month from April to September we offer prizes for the best readers' photographs sent in.

There are two restrictions only—the exposure must have been made by the competitor, and each print must bear a title. Any subject is eligible; any make of camera, plate, film or paper may be employed; there are no age restrictions and competitors may submit as many prints as they wish, provided that each individual print bears the competitor's name, age and address on its back.

To give younger readers a fair opportunity of success, the entries will be divided into two sections, A for competitors aged 16 and over, and B for those under 16; and in each section prizes of Meccano products or Photographic Materials to the value of 21/– and 10/6 respectively will be awarded to the first and second entries in order of merit. In addition, there will be a number of consolation prizes.

Entries must be addressed "April Photo Contest, Meccano Magazine, Binns Road, Old Swan, Liverpool," and must reach this office not later than 30th April. A duplicate set of prizes to the same value and in similar age groups will be awarded for Overseas competitors, that is, those living outside Great Britain and Ireland. Overseas entries to the April Contest must reach us not later than 30th July.

Unsuccessful entries will be returned if a stamped addressed cover is sent for the purpose. Prize-winning entries remain our property and can be returned only in very special circumstances.

COMPETITION RESULTS

OVERSEAS

Pet Drawing. First Prizes: Section A, D. Adams (Sydney, N.S.W.); Section B, I. Hood (Ryde, N.S.W.). Second Prizes: Section A, G. S. Brown (Taranaki, N.Z.); Section B, P. Vink (Rondebosch, S. Africa.).

Book Voting Contest. As will be seen from the appended results of the voting in this competition, there is not a great difference in the reading tastes of our Home and Overseas readers. In each section the four leading places were occupied by Engineering, Detective, Adventure and School stories, in that order, and the bulk of the votes in each section were concentrated on those subjects.

In the Home section of the contest, the remaining places were voted as follows:—Scientific; Travel; Exploration; Natural History; Sport; and Biography and History tied for the last two places. In the Overseas section, Sport, Travel and Exploration tied for the 5th and 6th places, and the remaining four subjects, Biography, History, Natural History and Scientific, tied for the 7th, 8th, 9th and 10th places.

The names of the prizewinners in the Home Section were announced in the December "*M.M.*," and the Overseas awards are as follows:—1. J. G. Gnanadurai (Trichinopoly); 2. R. Dale (Capetown); 3. I. Hood (Ryde, N.S.W.); 4. E. Cameron (Waikato, N.Z.). Consolation Prize: D. Atkinson (South Coast, N.S.W.).

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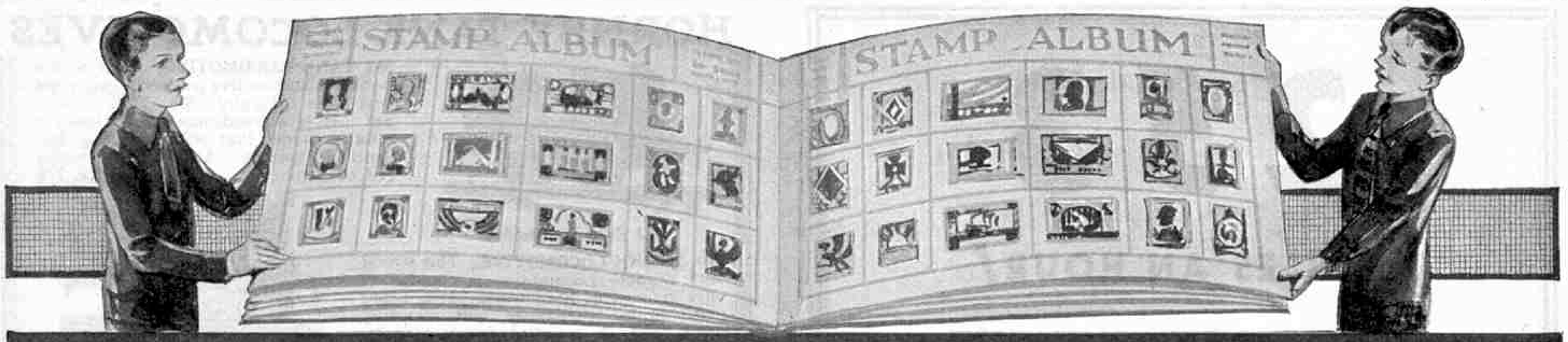

STAMP COLLECTING

NOTES ON NEW ISSUES

THERE are so many items of special interest among the new issues available this month that it is really difficult to select the outstanding item for priority of description. Let us take charity's maxim and begin nearest home—in the British Empire.

New Zealand cannot be considered near home in the physical sense, but there is no British Dominion nearer home in sentiment, and most English boys would be proud to claim as "pal" the jolly young ruffian whose portrait appears on New Zealand's 1931 Anti-tuberculosis issue, illustrated here. This design is used for each of the two stamps in the series, 1d. + 1d. and 2d. + 1d.

Were it possible to secure figures, it would be interesting to compare the results from this "jolly" issue with those achieved by the stark realism of the designs of the Dutch Child Welfare issue, illustrated in our January issue. Each stamp seeks to arouse pity for suffering, the New Zealand issue by depicting the glorious health of a normal boy, the Dutch issue by its display of the disabilities of invalid children.

The production of the New Zealand air stamp, illustrated here, is rather disappointing. The series of three stamps, 3d., 4d. and 7d. values, was produced specially for the Australasia Christmas mail flight to England, and the same design was used for each.

Another new item of special interest from New Zealand is the publication of the official list of selected designs and prizewinners in the recent competition for designs for a new general stamp issue for New Zealand. With one exception, all the winning entries are the work of local artists, but as the list is of interest only to a small section of our readers we do not think it necessary to publish it here. It would occupy much valuable space.

The designs chosen are as follows:—½d., Fantail in Clematis; 1d., Kiwi; 1½d., Maori Girl cooking food; 2d., Maori Ware; 2½d., Mount Cook with surround of local lilies; 3d., Head of Maori Girl; 4d., Mitre Peak; 5d., Swordfish; 6d., A reaper; 8d., Tuatara; 9d., Maori ornament and decoration; 1/–, Droving; 2/–, Landing of Captain Cook; 3/–, Egmont.

The dies and plates for the new issue are to be prepared in England, but the stamps probably will be printed in New Zealand, the lower values being typographed and the higher recess-printed, some in two colours probably.

Indian Native State Commemorative Issue

Commemorative issues among the Indian native states are still sufficiently rare to command considerable attention among collectors of British Colonials. The three stamps issued by Travancore to celebrate the investiture of the young Maharajah with full ruling powers are therefore likely to prove extremely popular, despite certain shortcomings in the quality of their production.

The stamps are denominated 6 cash, 10 cash and 3 chuckrams in value. The lowest value illustrated here shows a view of the Sri Padmanabha Shrine at Trivandrum, a temple dedicated to the god Vishnu, the deity of the Rajah's family. In the top corner of the frame the sacred elephants of Travancore are shown. The 10 cash stamp shows the beautiful state coach of Travancore drawn by three pairs of gorgeously caparisoned horses with outriders. The 3 chuckrams value shows a portrait of the Maharajah.

Siam also includes a portrait of its ruler in a commemorative series issued this month to celebrate the 150th anniversary of the establishment of the present dynasty and the building of the city of Bangkok. The denominations are 3, 5, 10, 15, 25 and 50 satangs and 1 baht. The design of the highest value shows the King upon his throne with his sword resting on his knees. The lower values are made up in two formats, perpendicular and horizontal, but employ a design common to all, showing a composite portrait of the present King and of his ancestor who founded the Royal house in 1782.

The most important European issue this month is Switzerland's series in celebration of the International Disarmament Conference opened at Geneva on 2nd February. The series comprises six stamps, 5, 10, 20, 30 and 60 cents and 1 franc, and it is intended that they shall remain in use for 12 months, displacing temporarily the normal issues in those values. Each of the five lower values has the design illustrated here, showing the dove of peace alighting on the blade of a broken sword held in a mailed fist. The design for the one franc stamp is also symbolical, and shows the Spirit of Concord holding aloft a flaming torch.

A short air mail set of three stamps, 15, 20 and 30c., is introduced also. The design is the same for each stamp and shows a three-engined commercial air machine in flight.

The Balkans—once the cockpit of Europe—are not behind-hand in these efforts to promote international harmony, and we illustrate here the interesting design of the stamp issued by Turkey to celebrate the conference of the Balkan States at Istanbul last autumn. It shows an olive tree, superimposed on a map of the Balkan States, with its roots spreading out to the capitals of the six States: Ankara (Turkey); Athens (Greece); Tirana (Albania); Belgrade (Jugo-Slavia); Sofia (Bulgaria), and Bucharest (Roumania). The design was the same for each of the nine values in the issue, 2½k., 4k., 6k., 7½k., 12k., 12½k., 30k., 50k. and 100k.

Sweden breaks new ground with a first pictorial stamp, denominated 5 kroner. The design shows the Royal Palace at Stockholm, with the River Norrstrom in the middle distance and a statue of King Charles XII in the left foreground.

We illustrate also specimen stamps from the U.S. Washington Bi-centenary commemorative issue and the Canal Zone's new air set, and will refer to these in detail in our next issue.

253

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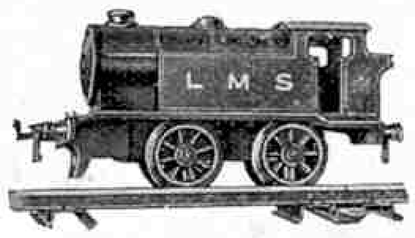
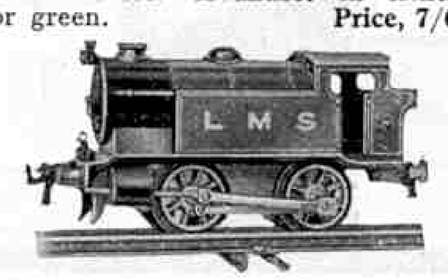
HORNBY TANK LOCOMOTIVES



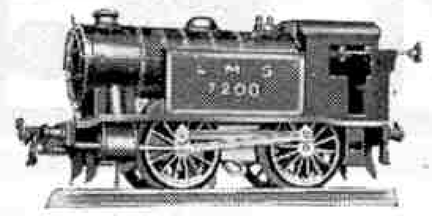
M3 Tank Locomotive

M3 TANK LOCOMOTIVE. This is the powerful Locomotive (reversing) supplied with the Hornby M3 Tank Goods Set. It is a handsome and extremely reliable model that will give long and excellent service. Available in either red or green. **Price, 7/6**

No. 1 TANK LOCOMOTIVE. This strong and durable Locomotive is capable of any amount of hard work. It is fitted with brake mechanism and reversing gear, and is supplied in colours to represent L.M.S.R., L.N.E.R., G.W.R. or S.R. Locomotives. **Price, 13/6**



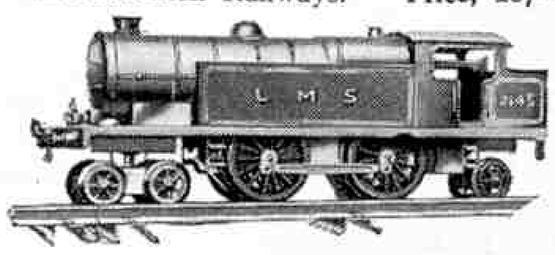
No. 1 Tank Locomotive



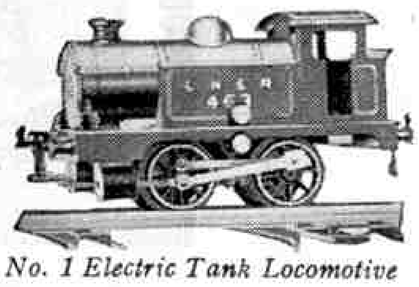
No. 1 Special Tank Locomotive

No. 1 SPECIAL TANK LOCOMOTIVE. This splendid Locomotive which is fitted with brake mechanism and reversing gear, has remarkable power and gives a very long run. It is available in the colours of the L.M.S., L.N.E., G.W. and Southern Railways. **Price, 18/-**

No. 2 SPECIAL TANK LOCOMOTIVE. This Locomotive has great length of run and exceptional pulling power. It is fitted with brake mechanism and reversing gear. In every respect it is a perfect model, beautifully finished in the colours of the L.M.S., L.N.E., G.W. and Southern Railways. **Price, 25/-**



No. 2 Special Tank Locomotive

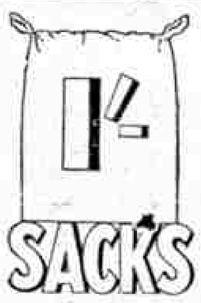


No. 1 Electric Tank Locomotive

No. 1 ELECTRIC TANK LOCOMOTIVE. This Locomotive is of the permanent magnet type, and may be run from a 6-volt accumulator. It can be stopped, re-started, reversed and the speed varied by the operation of levers at the side of the track. It is supplied with a terminal connecting plate, speed and reverse control switch and 3 feet of flex, and it is available in the colours of the L.M.S., L.N.E., G.W., and Southern Railway Locomotives. **Price, 32/6**

This Locomotive cannot be run from the mains supply.

MECCANO LTD. - OLD SWAN - LIVERPOOL



These Sacks contain ¼ lb. of unsorted Foreign and Colonial Stamps, **1/-**. If required off paper, ¼ lb. (about 4,500), **5/-**. Irish only, ¼ lb. **1/3**, Colonial, ¼ lb. **2/6**. Postage 2d.

List of others sent.

PHIL, 20, CASTLE ST., DOVER.

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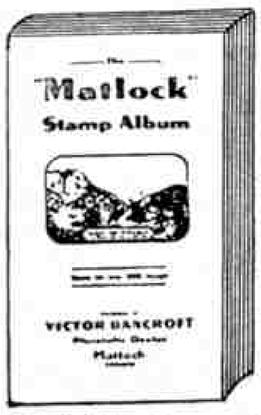

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For 30 days (abroad 60 days) we will send absolutely free to all new applicants for approvals, who enclose 2d. for postage, a stamp catalogued at 1/6 (or send 1/3 and receive 3 stamps catalogued at 8/6) if application is made to Department 173.

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65 SPECIAL Different Free

To introduce my excellent approval service to a few more genuine collectors, I am offering the above packet free, which includes Iraq (obsolete), F.M.S. (Tigers 3), Str. Sett. (2), S. African Pictorials (3), Gold Coast (obsolete), and many other good stamps, to all who request to see my approval books of British Colonials and Pictorials, priced from ½d. each, less 25% discount.

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Where possible specially requested Colonies will be included. State whether quality or quantity is required.

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from which you may select any 100 for **3/-**. This selection is **not** made up of the thousand commonest stamps, but contains specimens priced by Stanley Gibbons up to 1/- each. For 3/- you have the opportunity of choosing 100 stamps of the catalogue value of 20/- or more.

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A new set of handsome pictorial stamps from this British West African Colony, sent free of charge to bona-fide applicants for selections of duplicates on approval. 50 Soviet Russia, all different, post free, **1/3.**

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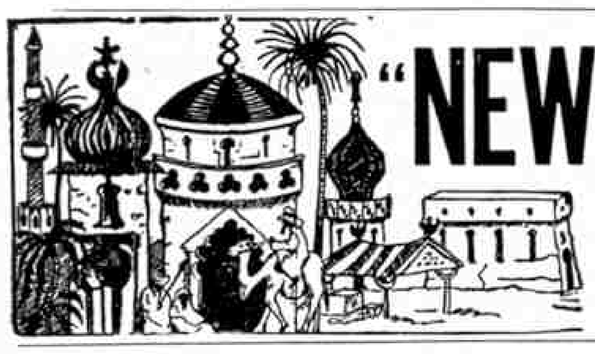

"NEW ORIENTAL" PACKET

Owing to the enormous success of the "Oriental" Packet, I am now offering a slightly different Packet of Orientals of even better value. **30** Stamps in all: **EGYPT** (large pictorial, etc.), fine Set of **6 TURKEY** (pictorials, etc.), Set of **PALESTINE, SYRIA** unused, Set of **ALGERIA,** including high values, **MESOPOTAMIA,** Set of **TUNIS** new issues, etc., **ALAOUITES** (Minaret), **GREEK** surcharged, a beautiful Set of **MOROCCO, AIRPOST,** etc. Price 4½d., postage **2d.** (abroad **3d.** extra). **PURCHASERS OF THE ABOVE PACKET** asking for Approval Sheets will be presented with a unique Set of **10 PERSIA** (usually sold at **1/6**). Satisfaction guaranteed or money returned. Senders of Addresses of Stamp-Collecting Friends will receive in addition another Set **FREE.**

10 PERSIA FREE

H. C. WATKINS, "M" Dept., Granville Road, BARNET

For further Stamp Advertisements see page 328

Stamp Gossip

and Notes on New Issues

French Sinking Fund Issue

Many readers who recall the 1930 French Sinking Fund stamp, with its "Angel of Rheims" design, illustrated in the *"M.M."* for August, 1930, will be interested to know that the total sum raised by this stamp for sinking fund purposes was 899,377 francs.

The "Caisse d'Amortissement" was founded in 1920 for the purpose of paying off French Public Debts, particularly the inter-Allied War Debts, and the issue of special postage stamps is only one of its many activities. The first stamp issue was made in 1927, and in addition to the special designs, the latest of which was illustrated in our Stamp Gossip Notes for August last, various current issues have been overprinted with the letters C.A., the nominal values for the 1931 series being surcharged with premiums as follows :---50c. + 10c., 50c. + 5c., 1 fr. 50 + 50c. The overprinted stamps issued in 1930 raised 169,571 francs, but these figures are by no means a record. The 1928 special design raised 1,391,300 francs, and the overprinted issues of the same year, 257,061 francs.

We understand that it is intended to discontinue the special issues after the 1931 series is withdrawn on 30th September next. In their stead an Anti-tuberculosis charity series will be issued each year.

Costa Rica Puts Things Right

When Costa Rica placed a new issue of air stamps on sale recently, the supply was so small that a group of stamp dealers "cornered" it in a matter of minutes. Subsequently, following an allegation that the whole transaction was a "put-up" job, both the small printing and the "corner" being pre-arranged, the Minister of Posts was severely criticised in Congress for the laxity of his department. The upshot is that a further 30,000 sets, indistinguishable in any detail from the first printing, are to be placed on sale.

Costa Rica has been on the stamp-collecting black list for quite a number of years, but drastic action of this sort is the right way to re-habilitation.

Air Mail "Stunts"

One does not usually associate the carrying of air mail with "stunting" in the usually accepted meaning of the word as applied to aviation. The air mail pilot's job is to take the shortest safe route between two given points and cover it without further ado.

That does not mean that "air mail" cannot be the subject of a "stunt." Quite the reverse, as certain American gentlemen have decided; and for sheer impudent stunting the "*Lusitania*" salvage operations air mail expedition deserves a medal—and a few bars. This is the proposition that was put forward for the acceptance of U.S. and British stamp collectors in a widely distributed circular.

At some time in February a special airplane flight with a bag of mail matter would be made from the Irish Coast to the point of the salvage operations over the sunken Cunarder "*Lusitania.*" The mail would be lowered in waterproof containers to the bridge of the sunken liner, then brought to the surface through the salvage tube, and rushed back to land for despatch from the nearest post office. The mail would be franked with U.S. and Irish stamps, the letter rate being one dollar! Surely the promoters lack imagination. For another dollar it might have been possible to arrange for the airplane to strike a floating mine when taking off on the return flight and for the pilot to swim ashore carrying the mail bag in his teeth!

What is stamp collecting coming to when schemes of this nature are proposed in all seriousness? The Irish Postal Authorities cannot decline to carry the mail after the "stunt" flight has been performed, but if, as is implied by the promoters' circular, official approval has been accorded to the "preliminaries," someone has blundered.

Our press date is rather too early for us to know whether the flight was actually carried through, but as the construction of the diving tube for the salvage operations was not commenced until the middle of February it seems an improbability. We hope that none of our readers will be tempted to purchase the covers when they come upon the market. Their worth will be nothing beyond the little interest they may possess as examples of what some collectors will "fall for."

* * * *

The Hungarian 5p. stamp has been withdrawn from circulation owing to the discovery that large quantities of this value have been illicitly cleaned and used again.

A Stamp Photo Contest

A few weeks ago a Maltese reader sent to us a photograph. Its view seemed familiar, as of a place we knew quite well, but it was several days before we discovered the reason. The view was exactly the same as that on Malta's ¼d. stamp of 1901—a favourite stamp of ours.

The idea of forming a small collection of such photographs occurs to us and as many other readers doubtless are in a position to help us, we offer prizes to the senders of the most interesting photographs of stamp scenes.

To give everyone a fair opportunity of competing, the offer will remain open until the end of October, and the sender of the best photograph in May—and in each subsequent month until October—will be allowed to choose stamps or stamp collecting accessories to the value of 10/6 from the list of any "*M.M.*" advertiser.

The competition is open to all readers of the "*M.M.*," and the only stipulation we make is that the entrant shall have made the exposure for the photograph. Entries should be addressed to "Stamp Scenes, Meccano Magazine, Binns Road, Old Swan, Liverpool."

South African Air Mail

We are indebted to Mr. E. W. S. Harris, of our publishers' South African Agency, and to several other South African readers, for their courtesy in sending for our acceptance flown covers by the first air mail from the Cape to London.

This mail, after leaving Capetown on 25th January, did not reach England until 16th February, a day or two after the arrival of mail posted at the same time and carried by steamer. The explanation is that the air liner *City of Basra*, on which the mail left Capetown, was damaged when taking off from Salisbury. The mails were transferred to the *City of Delhi* to continue the northward flight, but this machine also encountered trouble, a torrential rainstorm forcing it down in a swamp.

It was found impossible for the machine to take off again, and the mail was taken overland to Broken Hill and finally brought home with the second air mail that left Capetown on 3rd February.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

Trade **XACTUS** Mark
Registered

1/40th Scale Model Aeroplane Constructional Sets in WOOD. Have you made all the Series as follows ? :—

D.H. MOTH.
WESTLAND WIDGEON.
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The most realistic Models on the market when completed, price 2/6 each box, containing all WOOD parts correctly shaped and cambered for the construction of one Model, together with instructions, photograph, sandpaper, etc., etc.—More Models to follow shortly.

Note : See that you have the name "Xactus" on the box, and beware of Cardboard imitations.

AND WHAT ABOUT A "SPEED BOAT" ?—Parts for assembling a 22 in. span Model in WOOD, propelled by rubber, price 2/6.

OR A "LOCO" ! ! !—A Scale Model of the "SOUTHERN PACIFIC"—all parts in WOOD—price 2/-.

Buy "XACTUS" and get full value for your money, you will not be disappointed.

Obtainable at all leading Toy Stores, Stationers, etc., etc.

If your Dealer has not got "Xactus" in stock, please request him to do so, otherwise if an urgent order is required, send direct to the Manufacturer enclosing an extra 4d. for postage.

Sole Manufacturer :

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They use it in our NAVY

You want to remember that the Admiralty are big users of Seccotine; so when you are making models or mending things, think to yourself: "If I use Seccotine I'm doing what the Navy does—that's good enough for me."

Seccotine grips like riveted steel. Almost as strong as welding. Nothing can shake its vice-like hold. Easy to apply. A tube lasts ages. **SECCOTINE IS BRITISH.**

Ask your Dad to send the coupon to us for an interesting **free Booklet.**

Seccotine is obtainable everywhere in tubes, **4½d., 6d. and 9d.**

FIRMAS *Regd.* (Heat Seccotine)

If any model you make has to stand hot or boiling water, use FIRMAS Heat Seccotine, 6d. a tube.

Dept. M., McCaw, Stevenson & Orr Ltd., The Linenhall Works, Belfast

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POST COUPON FOR BOOKLET

To Dept. M., McCaw, Stevenson & Orr Ltd., Belfast.

Please send me, post free, free copy of your booklet describing extraordinary uses.

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Here are two tyres

that have been specially designed and built for you. One is a Roadster tyre with a tread of tough but lively black rubber. The other is a real Sports tyre with a very fast hard-wearing red tread. They are made by **DUNLOP**, and you know what that means. It means they are the best tyres you can buy.

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TYRES
SADDLES, TOOLBAGS
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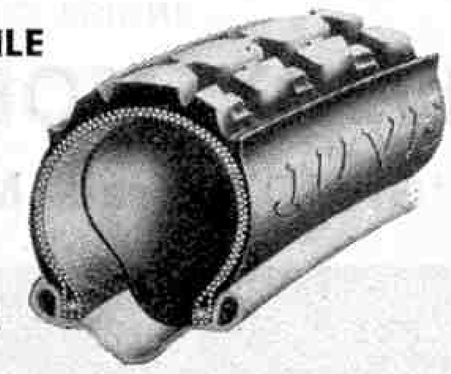
SIZE (wired type)
22″ x 1⅜″
24″ x 1⅜″
24″ x 1½″
26″ x 1½″

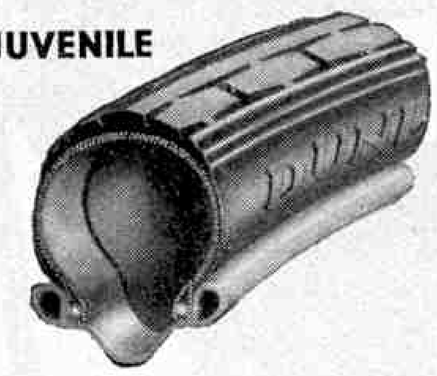
COVER 5/6 TUBE 2/6



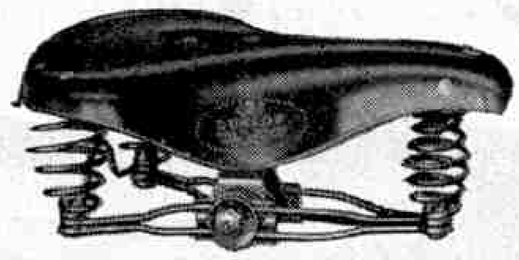
DUNLOP SPORTS JUVENILE

SIZE (wired type)
24″ x 1⅜″
24″ x 1½″
26″ x 1½″

COVER 4/6 TUBE 2/-



When you buy a new cycle be sure it is fitted with a
DUNLOP WATERPROOF SADDLE



Dunlop saddles are absolutely waterproof. Your Dad will tell you how important that is. They are comfortable, they never sag nor lose their shape, and they require no "breaking-in."

2H/56 C.F.H.

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The Original Motor cycle and Accessory Firm. Cycles and Accessories
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THE SPORTS HOUSE WITH 50 YEARS' REPUTATION

RACING CYCLES FROM **55/-**
Free Insurance.
Guaranteed 50 years.
SEND FOR FREE LIST.

ROADSTER CYCLES FROM **50/-**
Free accessories.
Carriage paid.
OVER 50 MODELS TO SELECT FROM.

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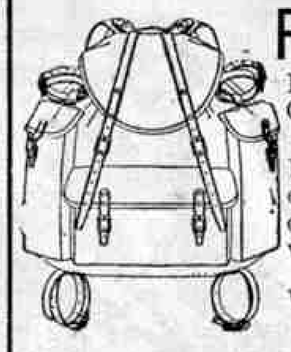
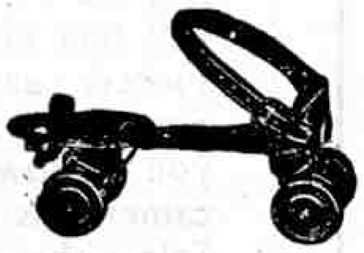


IDEAL FOR HIKING, CAMPING, HOLIDAYS, Etc. **12/-**
Carr. 9d.
Best weatherproof canvas, one large pocket, strong draw cord and eyelets, leather bound, waist and blanket straps, on 15 in. light metal frame.
With three pockets, on 16 in. frame, **16/9**
Carriage 9d.

BOYS' ROLLER SKATES



BALL BEARING, **7/6**
BRITISH MADE. Carriage 9d.
Exceptional value.

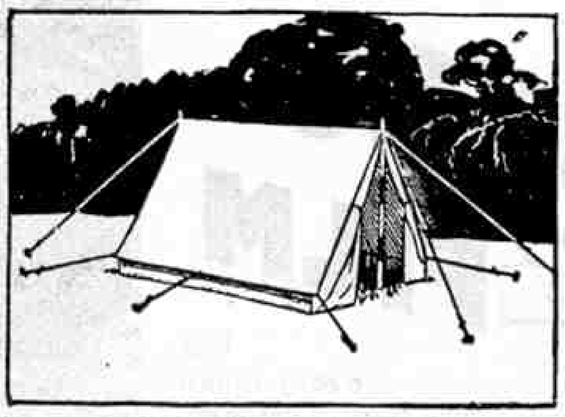
DON BRADMAN SIGNED CRICKET BATS

All Willow selected blade, treble rubber spring, SARAWAK cane handle.
Carriage 9d.
Size 4 5 6
10/6 11/6 12/6

LIGHTWEIGHT TENTS

SEND FOR HIKING AND CAMPING LIST 3d.

THE "EASIPITCH"
Suitable for 3 persons.
6 ft. long, 4 ft. 3 in. wide, 3 ft. 6 in. high, and 6 in. walls.
White **10/6** Cotton.
GREEN ROTPROOF TENT CLOTH, **18/6**
Carriage 9d.



Best quality rainproof tent cloth, metal jointed poles, pegs, mallet, runners, etc., packed in waterproof valise. Nett weight 4 lbs.

THE "TOURIST"
Suitable for 4 persons.
7 ft. long, 5 ft. wide, 4 ft. 6 in. high, and 1 ft. walls.
White **21/-** Duck.
GREEN WILLESDEN PROOFED CLOTH, **27/6**
Carriage 1/-

Fitted with jointed poles, runners, pegs, mallet, etc., overhanging eaves and ventilators, packed into a neat bag. Weight 10 lbs.

SPECIAL OFFER!

POLISHED ASH CRICKET STUMPS COMPLETE WITH BAILS.
16 in. **3/3** 18 in. **4/-**
Carriage 9d.

LEATHER BALLS

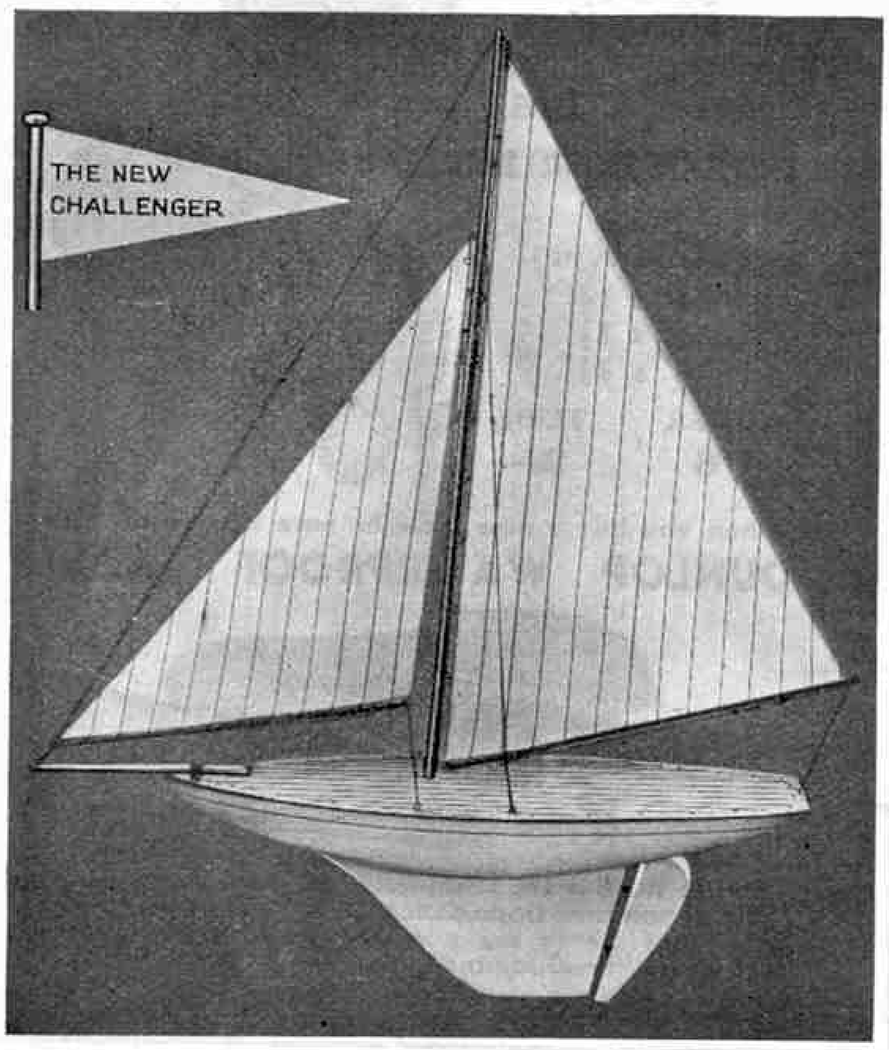
Treble stitched, best Colonial make **3/6**
Best British make **5/-**
Postage 3d.

For Speed & Workmanship

INSIST ON THE

'GIVJOY' MODEL BOATS

The 'GIVJOY' Trade Mark is a Guarantee



The Silver "GREYHOUND," 25" long, a beautiful model. Powerful Clockwork, with intermittent Siren. Works automatically from Pocket Battery. Patent 33132. **30/-**

The "GREYHOUND" Motor Boats are built for speed, streamlined and equipped with strong motors, both Clockwork and Electric. 2-blade brass propellers and brake control.

CLOCKWORK

GREYHOUND No. 6, Length 12¼", **5/-** each. GREYHOUND No. 7, Length 16¼", **7/6** each
GREYHOUND No. 8, Length 20½", **10/6** each

Superior finished, extra powerful Clockwork V, Length 21", **17/6** each
" " " " " IV, " 25", **22/6** "

ELECTRIC

Super Greyhound III, Length 25", **25/6** each. Super Greyhound I, Length 25", **35/-** each
No. 1 has 2-Speed Regulator worked by Two Batteries.

"CHALLENGER" RACING YACHTS

White enamelled hull with blue line, balanced rudder, weighted Keel, the lead being inset into the wood Keel, which avoids the possibility of the heavy lead Keel becoming detached. Varnished and lined decks, brass fittings. Sloop rig with Bermuda Lugsail and Staysail of best quality striped Sailcloth, Foresheet and Mainsheet running free on Deckhorses, which allow the Sails to adjust themselves, thus enabling the Yachts to tack automatically. Very simple to rig. The Mainmast has three supporting shrouds. Altogether, these Yachts have a most pleasing appearance and beautiful lines.

The broad beam, combined with this particular sloop rig, gives the most satisfactory results in light and stiff breezes.

On receipt of post card, we will advise you of our nearest agent.

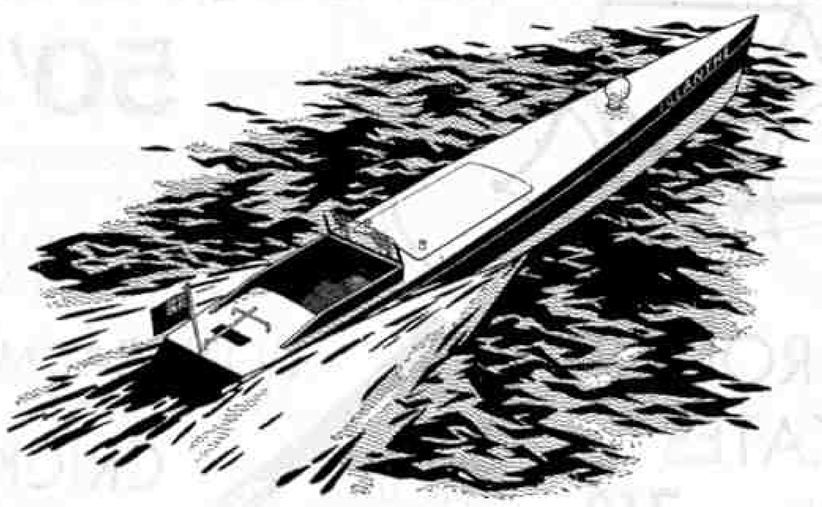
The New "Challenger" British built Yachts are second to none. Made in the following sizes—

14" **7/6**, 16" **10/6**, 18" **15/-**, 21" **21/-**, 23" **27/6**, 25" **35/-**, 30" **45/-**, 36" **63/-**

The larger sizes, 30" and 36", are provided with two sets of sails and spars—a full size set of sails (for sailing in light to moderate breeze) and the small set, for use in a stiff breeze.

A. J. HOLLADAY & CO. LTD., 3, Aldermanbury Ave., LONDON, E.C.2.

Model Boats Ahoy!



Just arrived from the Northampton Model Shipyards

"SWIFTA" SERIES 88. Spanking Boats from the tip of their bows to the red ensign fluttering astern. Fitted with bollards, ventilator, fairleads, etc. Hand finished white with blue and orange line.

Clockwork – – – **21/-**
Electric – – – **25/-**

Dimensions :
Length, 21 in. ; Beam, 33 in.

"SWIFTA" SERIES 99. Smart, modern design ; decks in mahogany, lined planking, windscreen, etc. Finished white, assorted colour boot topping.

Clockwork – **15/-** to **27/-**
Electric – **21/-** to **33/-**
according to length and beam.
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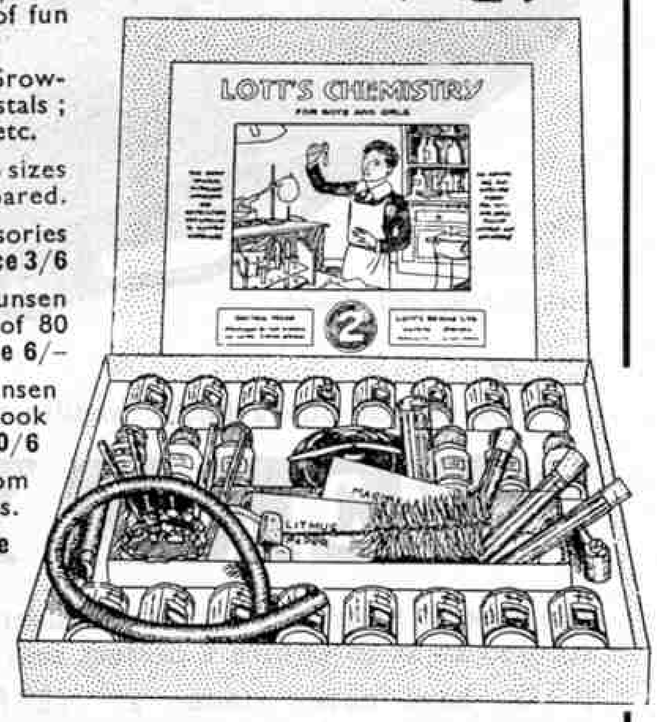

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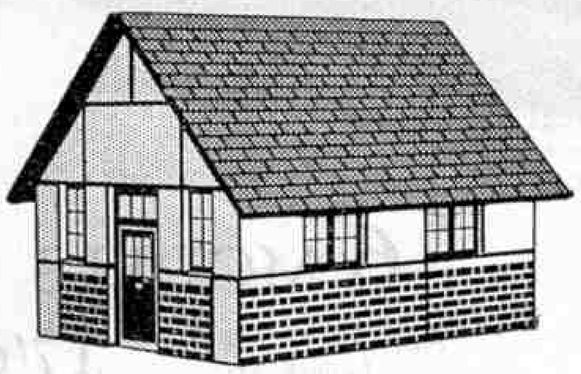

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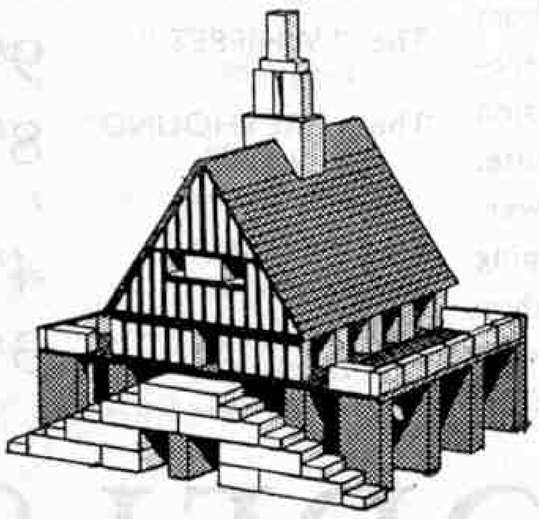

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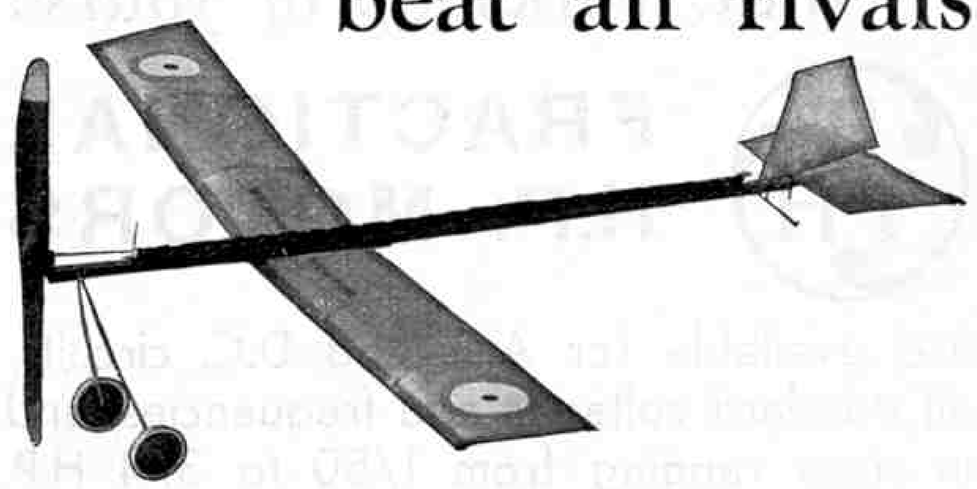

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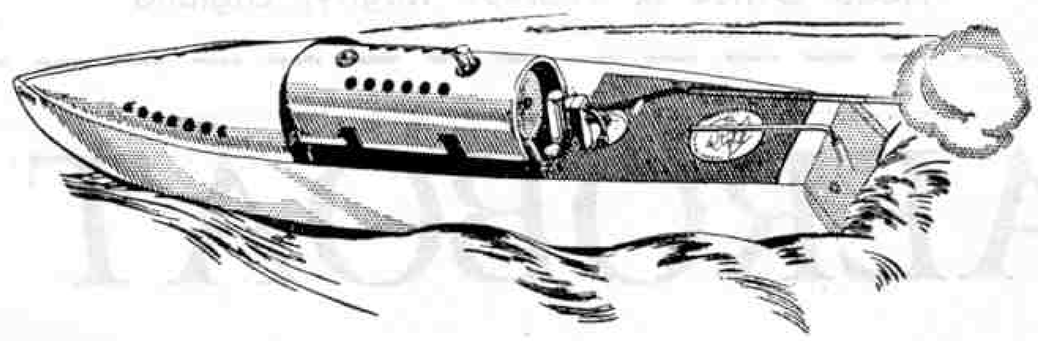

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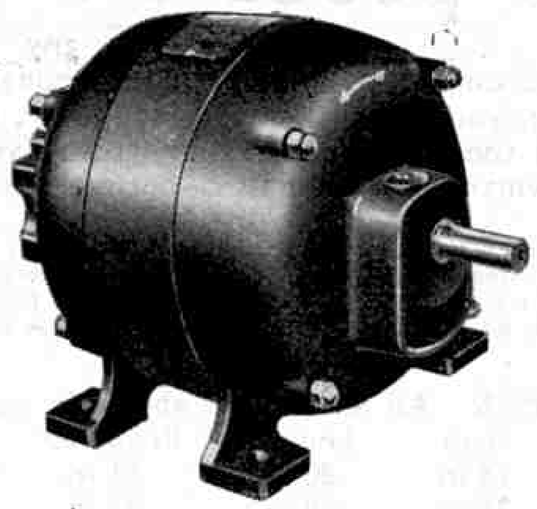

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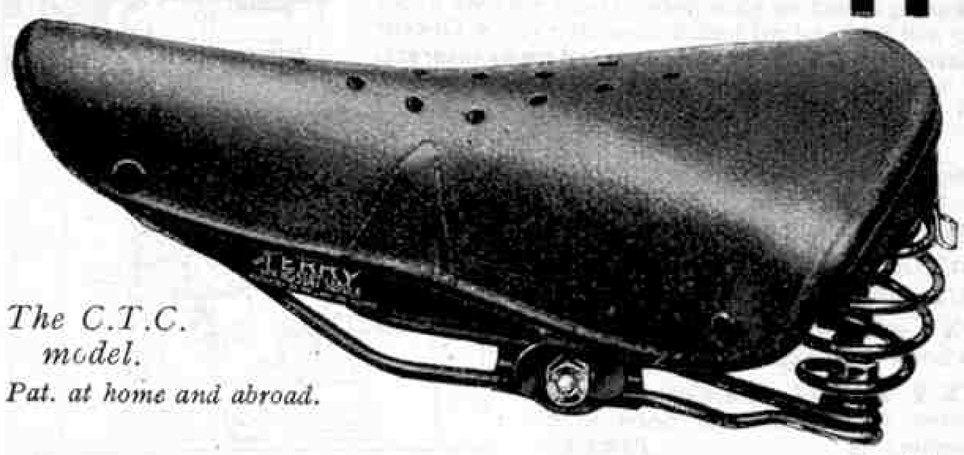

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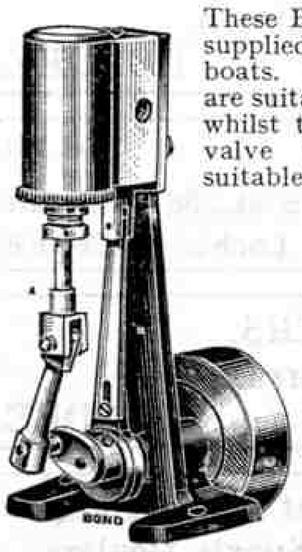

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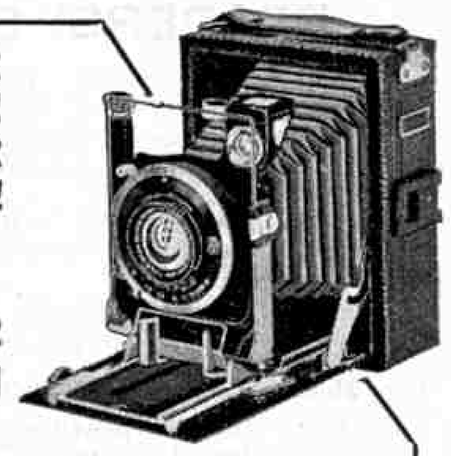

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MECCANO MAGAZINE

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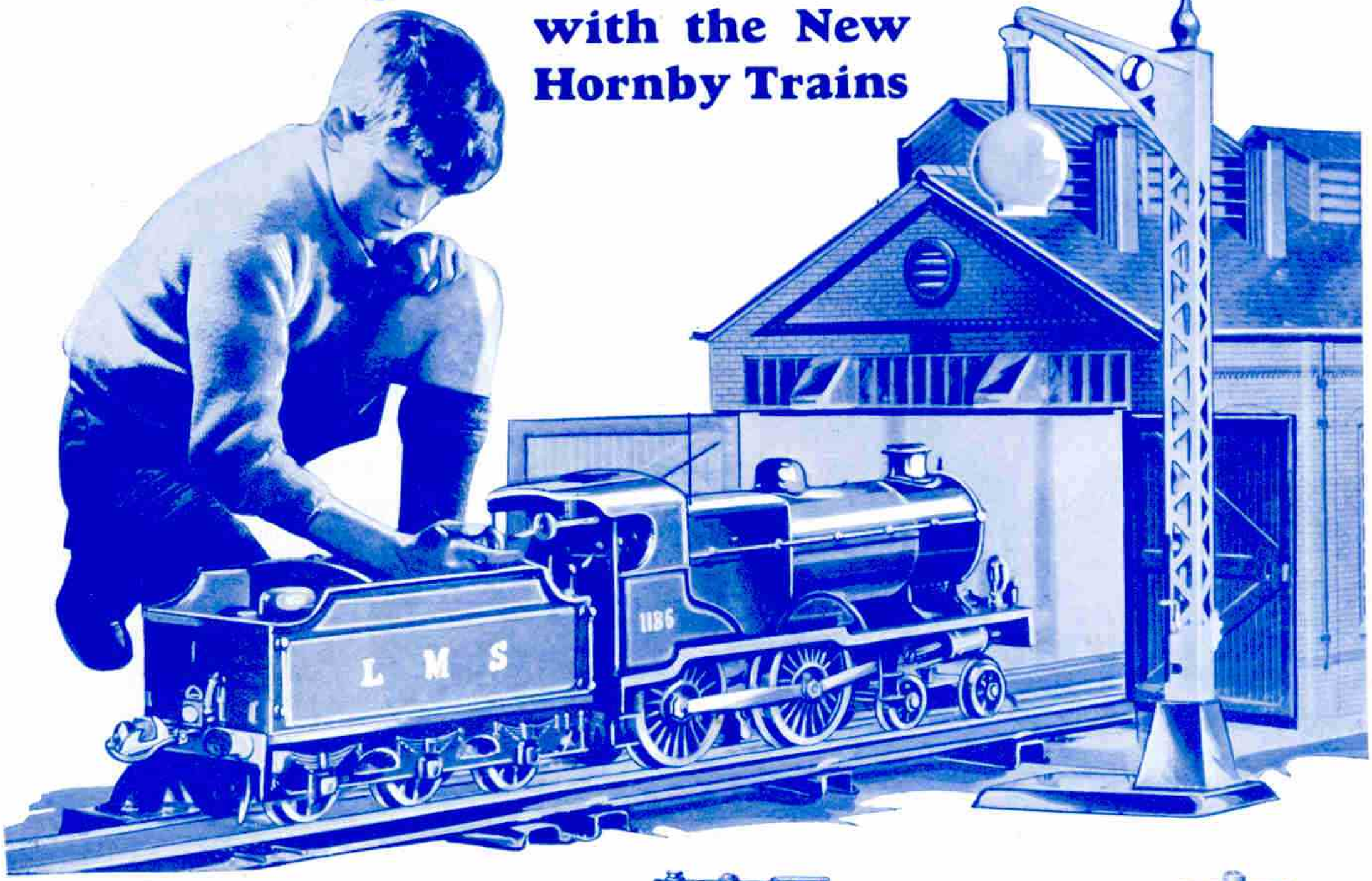

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This fine Goods Train Set is hauled by a reversing Tank Locomotive of great power and speed.
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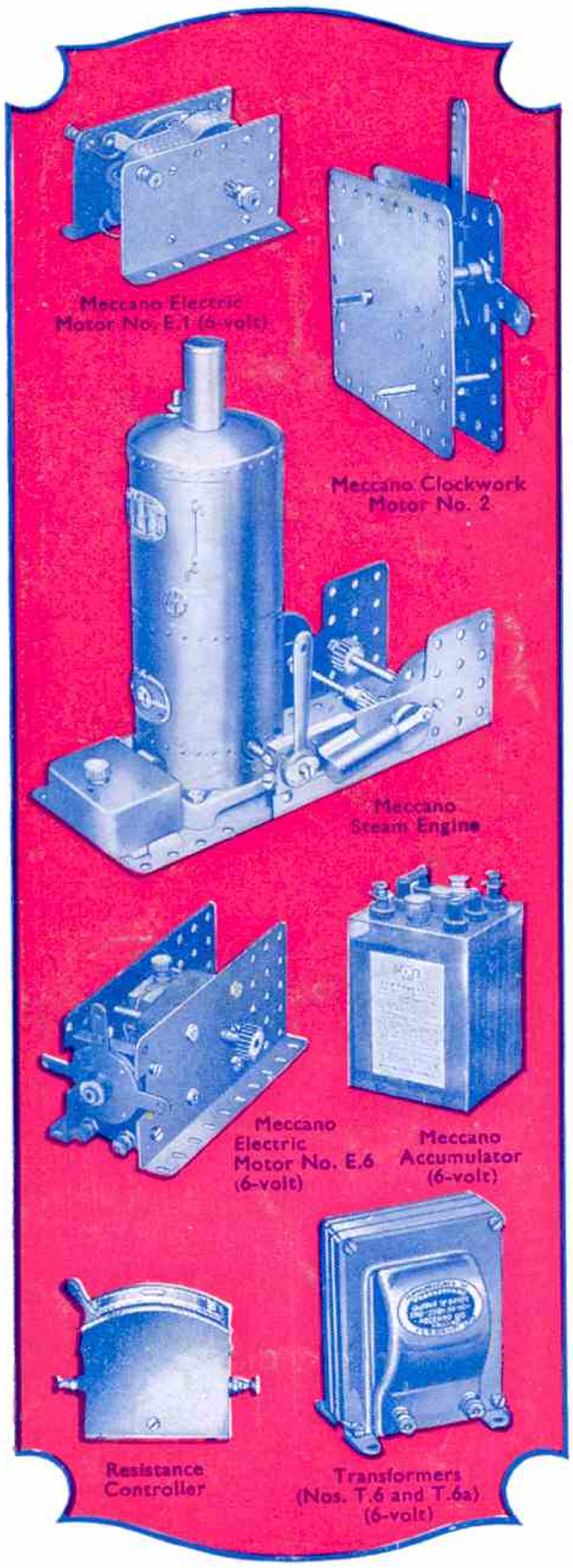

If you want to obtain the fullest possible enjoyment from the Meccano hobby you should operate your models with a Meccano Motor or Steam Engine. You push over the control lever of the motor or engine and immediately your Crane, Motor Car, Ship Coaler or Windmill commences to work in exactly the same manner as its " big brother " in real life. Could anything be more exciting ?

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(Reversing)

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(6-volt)

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IMPORTANT.—Meccano 6-volt Motors will not run satisfactorily from dry cells.

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The Meccano Accumulator is of substantial construction and is specially recommended for running the Meccano 6-volt Electric Motors. Price **28/6**

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No. T.6 is available for all standard supply voltages, from 100 to 250 inclusive, at frequencies of **50 cycles and upwards.**

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